

Appendix A6 INVESTIGATION OF PRESENT CONDITION OF BRIDGES

6.1 Pavement Design Sheet for Detailed Design Study

6.1.1 NGUYEN TRAI

Note: *Table No. and Figure No. is following 22TCN211-06.

D-1. Design Standard:

22TCN 211-06

D-2. Road Category:

Highway (2020 ~ 2035, 15years)

- Characteristics of Standard calculation axle load are as following

Table 6.1-1: Characteristics of Standard calculation axle load

Standard calculation axle load, P_{tt} (kN)	Calculation pressure on pavement, p (Mpa)	Diameter of wheel track, D (cm)
100	0.6	33
120	0.6	36

- From above table,

P_{tt} = 120 kN
 p = 0.6 Mpa
 D = 36 cm

D-3. Number of Lane:

6-lane -> f_l = **0.35** (f_l; coefficient from 4-lane to 1-lane)

D-4. Calculation of Vehicle Load

*From Chapter 2 (Direction 3+4, Daily Vehicle)

Table 6.1-2 Traffic Volume for each Vehicle type

Section: Tan Vu-Dinh Vu	MC	Car	Truck	Bus
2020	47,484	15,805	4,008	2,634
2025	46,538	28,342	3,954	4,040
2035	36,110	43,802	4,283	5,671

(Average annual growth rate 2020-2025) = 10.35 %

(Average annual growth rate 2025-2035) = 7.60 %

Types and Number of Trucks & Buses are sporsed as following:

	%	Number
Bus		
(Total)		5,671
- Small Bus	45.5%	2,579
- Large Bus	54.5%	3,092
Truck		
(Total)		4,283
- Light	72.7%	3,115
- Medium	12.3%	525
- Heavy	0.0%	0
- Heavy	0.0%	0
- Heavy	15.0%	643

- Calculation of a number of axles converted into a number of standard axles (Final year of design period)

Table 6.1-3 Calculation of Total Number of axles, N (2035)

Type of Vehicle		P _i (kN)	C1	C2	n _i	C ₁ *C ₂ *n _i *(P _i /P _{tt}) ^{4.4}	<-(3-1)
Small Bus	Front	26.4	1	6.4	2,579	21	
	Rear	45.2	1	1	2,579	35	
Large Bus	Front	56.0	1	6.4	3,092	692	
	Rear	95.8	1	1	3,092	1,148	
Light Truck	Front	18.0	0	6.4	3,115	0	
	Rear	56.0	1	1	3,115	109	
Medium Truck	Front	25.8	1	6.4	525	4	
	Rear	69.6	1	1	525	48	
Heavy Truck	Front	48.2	1	6.4	0	0	
	Rear	100.0	1	1	0	0	
Heavy Truck	Front	45.4	1	6.4	643	57	
	Rear	90.0	2.2	1	643	399	
Heavy Truck	Front	23.1	0	6.4	525	0	
	Rear	73.2	2	1	525	119	
Total					N=	2,632	

*P_{tt} = 120 kN

*Values of P_i, C1, C2 are determined by referring Table E-1

$$\begin{aligned}
 N_{tt} &= f1 * N = 0.35 * 2,632 \\
 &= 921 \text{ vehicles/day (2035)}
 \end{aligned}
 \tag{3-3}$$

- To calculate number of standard axle accumulated in the period of 15 years

$$N_e = \frac{[(1+q)^t - 1]}{q(1+q)^{t-1}} * 365 * N_{tt} \text{ (axles)} \quad (A-3)$$

t1= 5 (years), **q1=** 0.1035 (2020-2025)
t2= 10 (years), **q2=** 0.0760 (2025-2030)
Ntt1= 711 (vehicles/day), (See below calculation) (2020-2025)
Ntt2= 921 (vehicles/day), (See previous page) (2025-2030)

Table 6.1-4 Calculation of Total Number of axles, N (2025)

Type of Vehicle		P _i (kN)	C1	C2	n _i	C ₁ *C ₂ *n _i *(P _i /P _{tt}) ^{4.4} <--(3-1)
Small Bus	Front	26.4	1.0	6.4	1,837	15
	Rear	45.2	1.0	1.0	1,837	25
Large Bus	Front	56.0	1.0	6.4	2,203	493
	Rear	95.8	1.0	1.0	2,203	818
Light Truck	Front	18.0	0.0	6.4	2,876	0
	Rear	56.0	1.0	1.0	2,876	101
Medium Truck	Front	25.8	1.0	6.4	485	4
	Rear	69.6	1.0	1.0	485	44
Heavy Truck	Front	48.2	1.0	6.4	0	0
	Rear	100.0	1.0	1.0	0	0
Heavy Truck	Front	45.4	1.0	6.4	594	53
	Rear	90.0	2.2	1.0	594	368
Heavy Truck	Front	23.1	0.0	6.4	485	0
	Rear	73.2	2.0	1.0	485	110
Total					N=	2,030

Ntt(2025)= 2,030 * 0.35 = 711 (veh/day) (2025)

Therefore,

$$N_e = \frac{[(1+q_1)^{t1} - 1]}{q_1(1+q_1)^{t1-1}} * 365 * N_{tt1} + \frac{[(1+q_2)^{t2} - 1]}{q_2(1+q_2)^{t2-1}} * 365 * N_{tt2}$$

$$= 1,075,225 + 2,471,941 = 3,547,166 \text{ (axles)}$$

D-5. Determination of strength coefficient for design reliability and Required elastic modulus value

$$E_{ch} \geq K_{cd}^{dv} * E_{yc} = 1.10 * 202 = 222 \text{ (Mpa)} \quad (3-4)$$

K_{cd}^{dv} : Strength coefficient on deflection depending on reliability
 E_{yc} : Required elastic modulus value

Table 6.1-5: Determination of strength coefficient on deflection depending on reliability

Reliability	0.98	0.95	0.90	0.85	0.80
Strength coefficient K_{cd}^{dv}	1.29	1.17	1.10	1.06	1.02

Table 6.1-6 : Selection of design reliability by road type and class

Road type, class		Design reliability		
1. Expressway		0.90	0.95	0.98
2. Highway/road	-I, II Class	0.00	0.95	0.98
	-III, IV Class	0.85	0.90	0.95
	-V, VI Class	0.80	0.85	0.90
3. Urban road	-Expressway and urban arterial road	0.90	0.95	0.98
	-Other urban road	0.85	0.90	0.95
4. Specialized road		0.80	0.85	0.90

$$K_{cd}^{dv} = 1.10$$

Table 6.1-7 Required elastic modulus value

Types of standard axle load		Required elastic modulus value E_{yc} (Mpa), Corresponding to a number of calculation axles (vehicle/ day/lane)									
		10	20	50	100	200	500	1000	2000	5000	7000
10	High-grade A1			133	147	160	178	192	207	224	235
	High-grade A2		91	110	122	135	153				
	Low-grade B1		64	82	94						
12	High-grade A1		127	146	161	173	190	204	218	235	253
	High-grade A2	90	103	120	133	146	163				
	Low-grade B1		79	98	111						

$$E_{yc} = 190 + (204 - 190) * (921 - 500) / (1000 - 500) = 202 \text{ Mpa}$$

D-6. Design Condition

- Material Condition

Table 6.1-8 Material Properties for Each layer

Material	E(Mpa)			R _{ku} (Mpa)	C (Mpa)	φ (degree)	t (cm)
	Sliding	Deflection	Tensil and Flexure				
Surface Course	300	420	1800	2.8			5
Binder Course	350	350	1600	2.0			14
Asphalt Treated Base	350	350	800				12
Base	300	300	300				60
Embankment	50	50	50		0.028	21	-

- Surface Course : Bituminous layer type I (Surface Course) (BTNC20, Crushed Stone>50%)
- Binder Course : Bituminous layer type I(Binder Course) (BTNC25, Crushed Stone>50%)
- Asphalt Treated Base : Black crushed stone mixed with compact asphalt
- Base : Crushed Stone Aggregate Base Class I
- Embankment : Clay and loam, CBR=8

Note: *Values of Asphalt and Base were determined by referring to Table C-1

*E of Embankment was decided by formula B-5, (CBR=8)

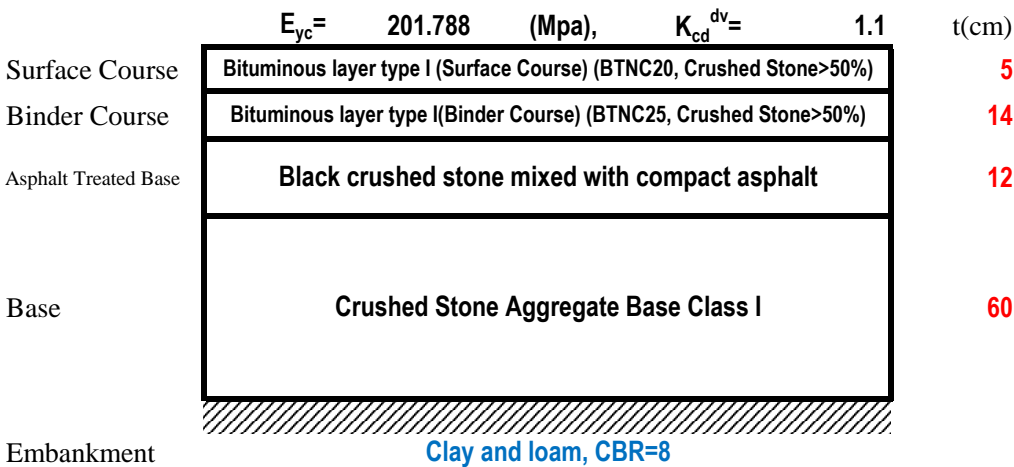
$$E=4.68*CBR+12.48=50(\text{Mpa})$$

*Values of Embankment were determined by referring to Table B-3 (W/W_{nh}=0.65)

*Minimum Asphalt thickness should be 12.5cm. (N_e>4.0*10⁶) (According to Table 2-2)

Therefore design condition is as following

- N_{tt}= 921 (vehicles/lane/day in 2035)
- N_e= 3,547,166 (axle for 15 years)
- P_{tt}= 120 (kN)
- p= 0.60 (Mpa)
- D= 36 (cm)



D-7. Cheking Deflection

No.	$K_{cd}^{dv} E_{vc} =$	222	Mpa	
4 Surface Course	$E_4 =$	420	Mpa	5 cm
3 Binder Course	$E_3 =$	350	Mpa	14 cm
2 Asphalt Treated Base	$E_2 =$	350	Mpa	12 cm
1 Base	$E_1 =$	300	Mpa	60 cm
	$E_0 =$	50	Mpa	

$$E_{TB} = E_1 \left[\frac{(1 + kt^{1/3})}{(1 + k)} \right]^3 \text{ Mpa} \quad k = \frac{h_1}{h_2} \quad t = \frac{E_2}{E_1} \quad (3-5)$$

The results are described in the below table:

Table 6.1-9 Calculation results of E_{tbi}

Layer	Material Courses	E_i (Mpa)	t $=E_2/E_1$	h_i (cm)	K $=h_2/h_1$	h_{tbi} (cm)	E_{tbi} (Mpa)
4	Surface Course	420	1.34	5	0.06	91	320
3	Binder Course	350	1.14	14	0.19	86	315
2	Asphalt Treated Base	350	1.17	12	0.20	72	308
1	Base	300		60		60	300

$$\begin{aligned}
 E_{tb5} &= \mathbf{320} \text{ daN/cm}^2 \\
 \beta &= \mathbf{1.245} \text{ (from below)} \\
 E_{TB}^{tt} &= \beta \cdot E_{tb} \\
 &= \mathbf{1.245} * \mathbf{320} \\
 &= \mathbf{398} \text{ Mpa}
 \end{aligned}$$

Table 6.1-10 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$$\beta = 1.114 * (H/D)^{0.12} \quad (\text{in case of } H/D > 2.0) \quad (3-6)$$

Where as;

D= **36** cm (Diameter of Wheel track)

H= **91** cm (Hight of the Layer)

Therefore

H/D= **2.53**

From Table/formula 3-6,

$$\begin{aligned}
 \beta &= 1.114 * (91/36)^{0.12} \\
 &= \mathbf{1.245}
 \end{aligned}$$

$E_0 = 50 \text{ Mpa}$, $E_{TB} = 398 \text{ Mpa}$
 $E_0/E_{TB} = 0.126$
 $H/D = 2.53$

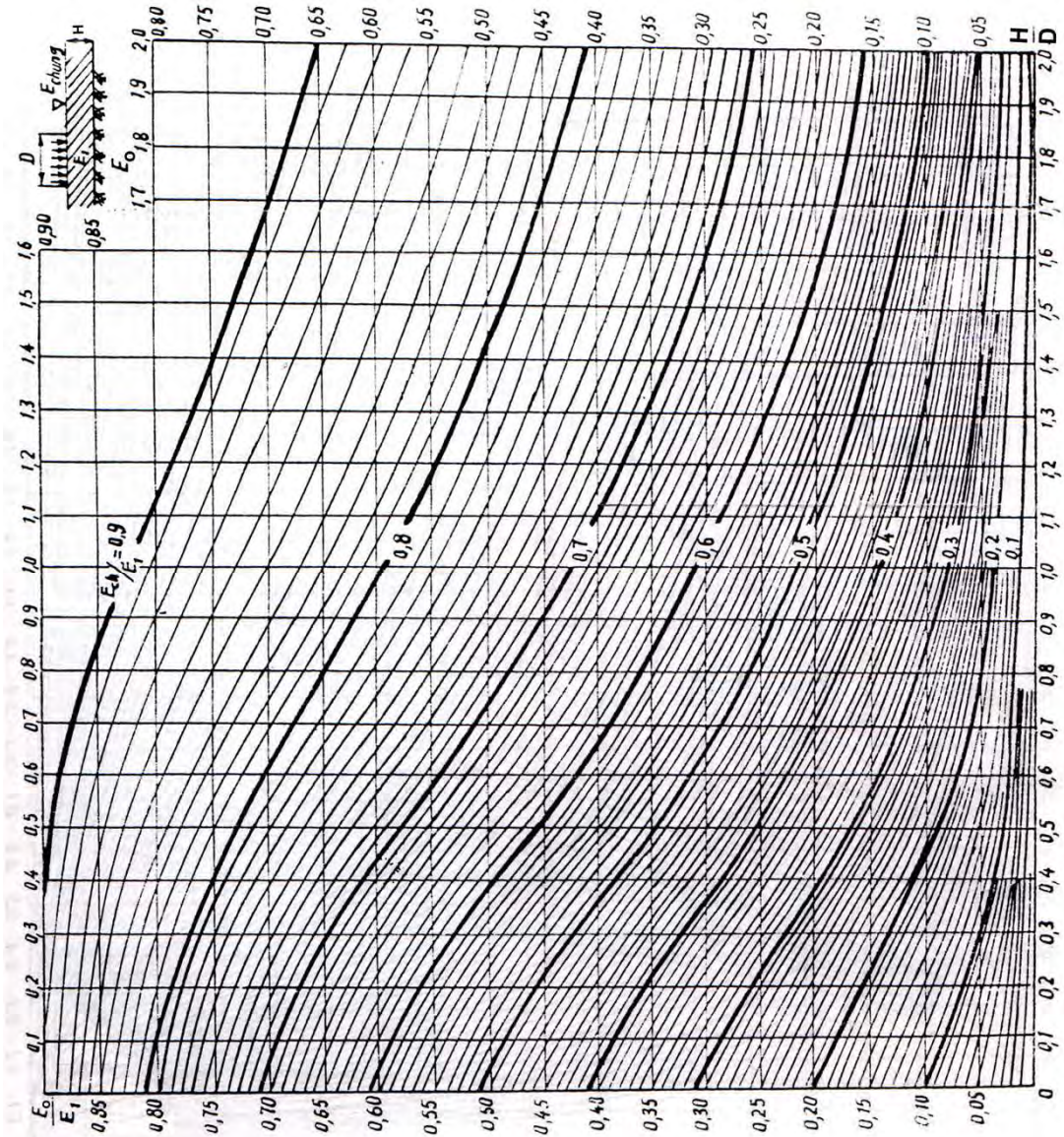


Figure 6.1-1. Monograph for determination of general elastic modulus of double-layer system Ech ($H/D < 2$)

$$E_{ch} = \frac{1.05 \cdot E_0}{1 + \frac{E_0}{E_1}} + \frac{E_0}{\sqrt{1 + 4 \cdot \left(\frac{H}{D}\right)^2 \cdot \left(\frac{E_0}{E_1}\right)^{-0.67}}} \quad (F-1) \quad (H/D > 2)$$

From above Table/Formular, $E_{ch} = 222 \text{ Mpa} \geq 222 \text{ Mpa} (=K_{cd}^{dv} * E_{vc})$ OK

D-8. Cheking Sliding

$$T_{ax} + T_{av} < \frac{C_{tt}}{K_{cd}^{tr}} \quad (3-7)$$

- T_{ax} : From Table 3-2 (H/D<2.0), or From Table 3-3 (H/D >2.0)
- T_{av} : From Table 3-4
- C_{tt} : From formula(3-8)
- K_{cd}^{tr} : From Table 3-7

- Detarmination of K_{cd}^{tr}

$$K_{cd}^{tr} = \underline{0.94} \quad (\text{From Table 3-7})$$

Table 6.1-11 Selection of coefficient of shear strength depending on reliability

Reliability	0.98	0.95	0.90	0.85	0.80
Coef. K_{cd}^{tr}	1.10	1.00	0.94	0.90	0.87

- Calculation of Ctt

$$C_{tt} = C * K_1 * K_2 * K_3 = \underline{0.0202} \text{ (Mpa)}$$

- C: **0.028** (Mpa) Cohesive force of fundation soil
- K_1 : **0.6** for pavement carriageway
- K_2 : **0.8** from Table 3-8

Table 6.1-12 Determination of Coefficient K2 depending on a number of design axles

A number of design axles (N_{tt}) (axle/day/lane)	Under 100	Under 1000	Under 5000	Over 5000
Coefficient K_2	1.00	0.80	0.65	0.60

* N_{tt} = **921**

- K_3 : **1.5** For types of cohesive soil (clay, clay loam, clay sand etc.)

No.	$C_{tt}/K_{cd}^{tr} =$	0.021		
4 Surface Course	$E_4 =$	300	Mpa	5 cm
3 Binder Course	$E_3 =$	350	Mpa	14 cm
2 Asphalt Treated Base	$E_2 =$	350	Mpa	12 cm
1 Base	$E_1 =$	300	Mpa	60 cm

$E_0 =$	50	Mpa
$C =$	0.028	Mpa
$\varphi =$	21	degree

- Determination of T_{ax}

Table 6.1-13 Calculation results of E_{tbi}

Layer	Material Courses	E_i (Mpa)	t $=E_2/E_1$	h_i (cm)	K $=h_2/h_1$	h_{tbi} (cm)	E_{tbi} (Mpa)
4	Surface Course	300	0.95	5	0.06	91	314
3	Binder Course	350	1.14	14	0.19	86	315
2	Asphalt Treated Base	350	1.17	12	0.20	72	308
1	Base	300		60		60	300

$$\begin{aligned}
 E_{tb} &= \mathbf{314} \text{ daN/cm}^2 \\
 \beta &= \mathbf{1.245} \text{ (from below)} \\
 E_{TB}^{tt} &= \beta \cdot E_{tb} \\
 &= \mathbf{1.245} * \mathbf{314} \\
 &= \mathbf{391} \text{ Mpa}
 \end{aligned}$$

Table 6.1-14 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$$\beta = 1.114 * (H/D)^{0.12} \quad (\text{in case of } H/D > 2.0) \quad (3-6)$$

Where as;

$$D = \mathbf{36} \text{ cm} \quad (\text{Diameter of Wheel track})$$

$$H = \mathbf{91} \text{ cm} \quad (\text{Hight of the Layer})$$

Therefore

$$H/D = \mathbf{2.53}$$

From Table/formula 3-6,

$$\beta = 1.114 * (91/36)^{0.12}$$

$$= \mathbf{1.245}$$

$E_0 = 50$ Mpa , $E_{TB}^{tt} = 391$ Mpa
 $E_{TB}^{tt}/E_0 = 7.81$
 $H/D = 2.53$, $\varphi = 21$ degree

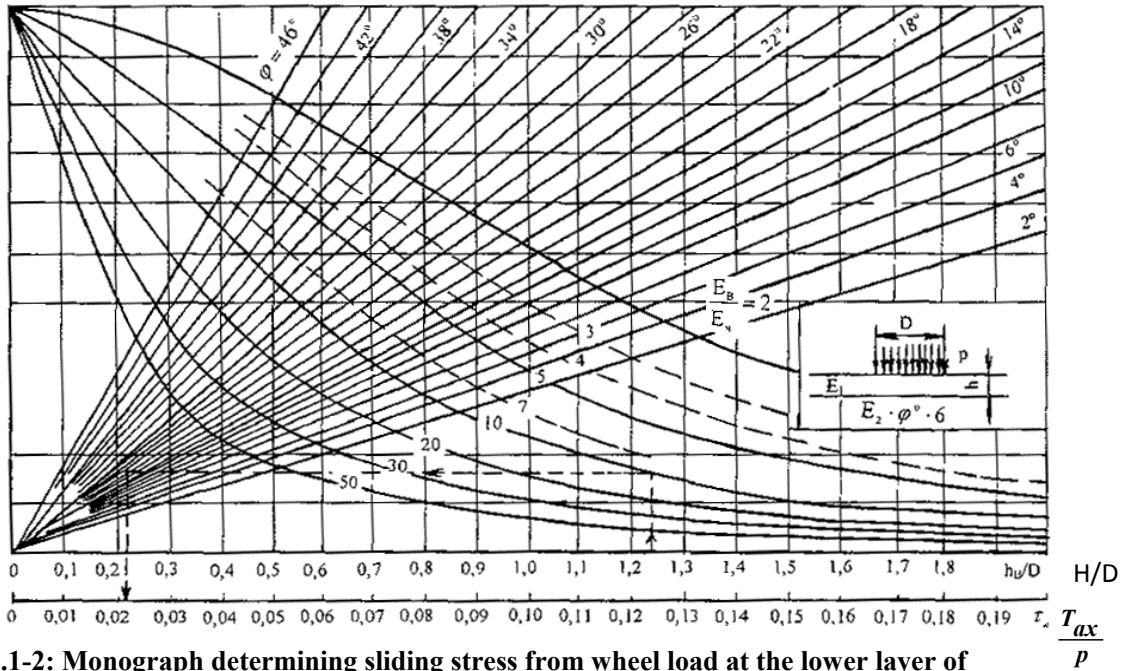


Figure 6.1-2: Monograph determining sliding stress from wheel load at the lower layer of the double-layer system ($H/D = 0 \sim 2$)

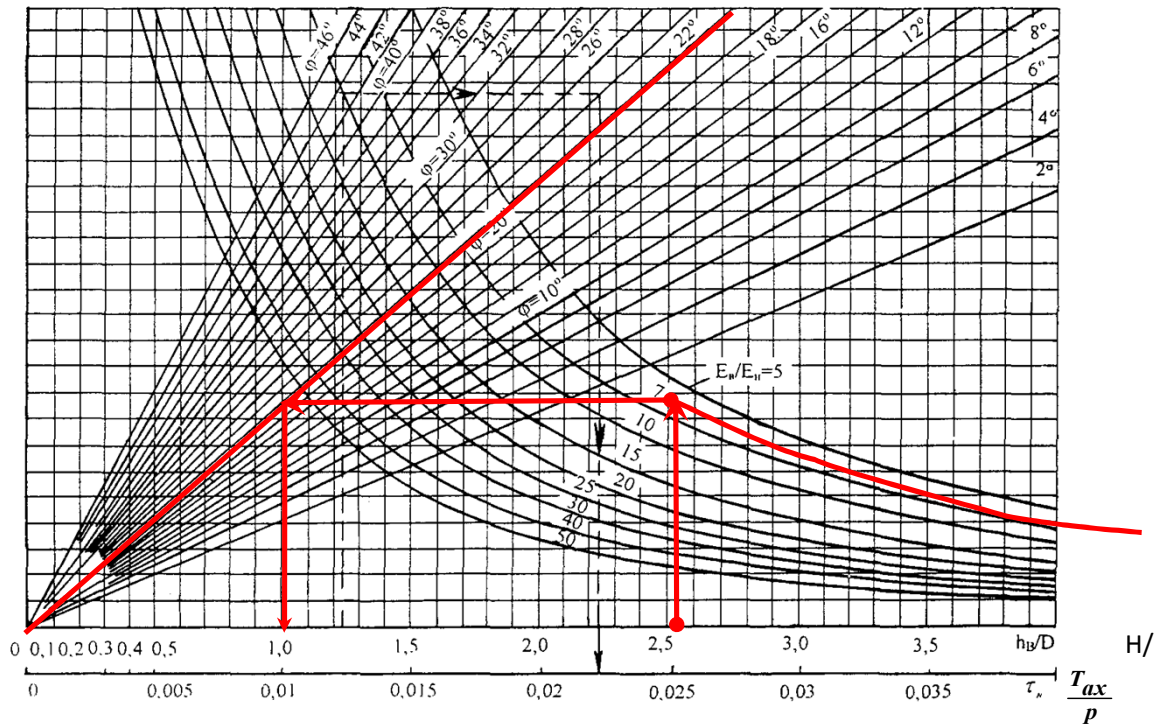


Figure 6.1-3: Monograph determining sliding stress from wheel load at the lower layer of the double-layer system ($H/D = 0 \sim 4$)

From above Figure, $T_{ax}/p = 0.010$, $p = 0.60$ Mpa
 Therefore $T_{ax} = 0.006$ Mpa

- Determination of T_{av}

H= 91 cm
 φ = 21 degree

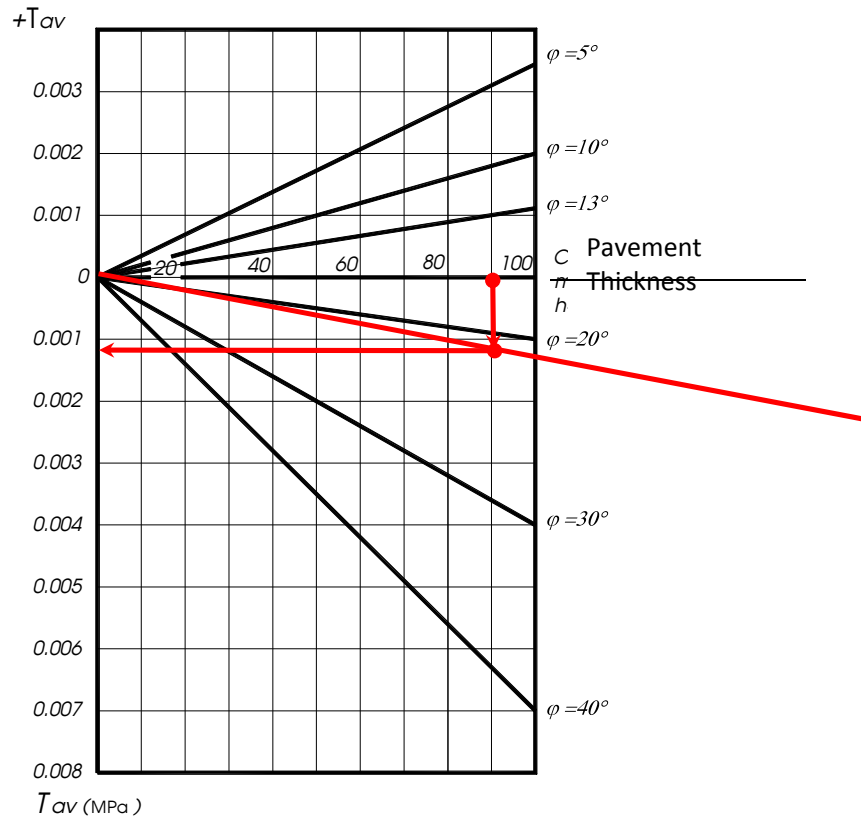


Figure 6.1-4. Monograph for finding active shearing stress T_{av} by self weight of pavement

From above Figure,

$T_{ax} = -0.0011$ Mpa

- Cheking Sliding

$$T_{ax} + T_{av} < \frac{C_{tt}}{K_{cd}^{tr}} \quad (3-7)$$

$T_{ax} = 0.006$ Mpa
 $T_{av} = -0.0011$ Mpa
 $C_{tt} = 0.0202$ Mpa
 $K_{cd}^{tr} = 0.94$ Mpa

$T_{ax} + T_{av} = 0.006 + (-0.0011) = 0.0049$
 $C_{tt}/K_{cd}^{tr} = 0.0202 / 0.94 = 0.0214$

$T_{ax} + T_{av} < C_{tt}/K_{cd}^{tr}$ OK

D-9. Cheking Flexural Strength

$$\sigma_{ku} \leq \frac{R_{tt}^{ku}}{K_{cd}^{ku}} \quad (3-9)$$

$$\sigma_{ku} = \overline{\sigma}_{Ku} * p * K_b \quad (3-10)$$

$\overline{\sigma}_{ku}$: the value shall be determined by Figure 3-5, 3-6, (See after)

p: = **0.60** Mpa

Kb= **1.00** (for the heaviest special axle load)

$$R_{tt}^{ku} = k_1 * k_2 * R_{ku} \quad (3-11)$$

$$k_1 = 11.11 / N_e^{0.22} \quad (\text{for asphalt concrete material}) \quad (3-12)$$

$$= 11.11 / 3,547,166^{0.22} = \underline{\underline{0.40}}$$

$$N_e = 3,547,166 \quad (\text{axle for 15 years})$$

$$k_2 = 1.00 \quad (\text{for material consolidated with inorganic material})$$

$$R_{ku} = 2.80 \quad (\text{for Surface Course, See D-7 Design Condition})$$

$$2.00 \quad (\text{for Binder Course, See D-7 Design Condition})$$

$$K_{cd}^{ku} = 0.94 \quad (\text{From Table 3-7})$$

- Design Condition

No.

4 Surface Course	$E_4 =$	1800	Mpa	5 cm
3 Binder Course	$E_3 =$	1600	Mpa	14 cm
2 Asphalt Treated Base	$E_2 =$	800	Mpa	12 cm
1 Base	$E_1 =$	300	Mpa	60 cm
$E_0 =$				50 Mpa

Table 6.1-15 Calculation results of E_{tbi}

Layer	Material Courses	E_i (Mpa)	t $=E_2/E_1$	h_i (cm)	K $=h_2/h_1$	h_{tbi} (cm)	E_{tbi} (Mpa)
4	Surface Course	1800	3.69	5	0.06	91	533
3	Binder Course	1600	4.42	14	0.19	86	487
2	Asphalt Treated Base	800	2.67	12	0.20	72	362
1	Base	300		60		60	300

A) Cheking of Surface Course

$h_1 =$ **5** cm, $E_1 =$ **1800** Mpa

$E_{tb4} =$ **487** Mpa (from Table D9-1)

$\beta =$ **1.237** (from below)

$E_{TB}^{tt} = \beta \cdot E_{tb}$

$=$ **1.237** * **487**

$=$ **603** Mpa

Table 6.1-16 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$\beta = 1.114 \cdot (H/D)^{0.12}$ (in case of $H/D > 2.0$) (3-6)

Where as;

$D =$ **36** cm (Diameter of Wheel track)

$H =$ **86** cm (Height of the Layer)

Therefore

$H/D =$ **2.39**

From Table/formula 3-6,

$\beta = 1.114 \cdot (86/36)^{0.12}$

$=$ **1.237**

$E_0 = 50$ Mpa , $E_{TB} = 603$ Mpa
 $E_0/E_{TB} = 0.083$
 $H/D = 2.39$

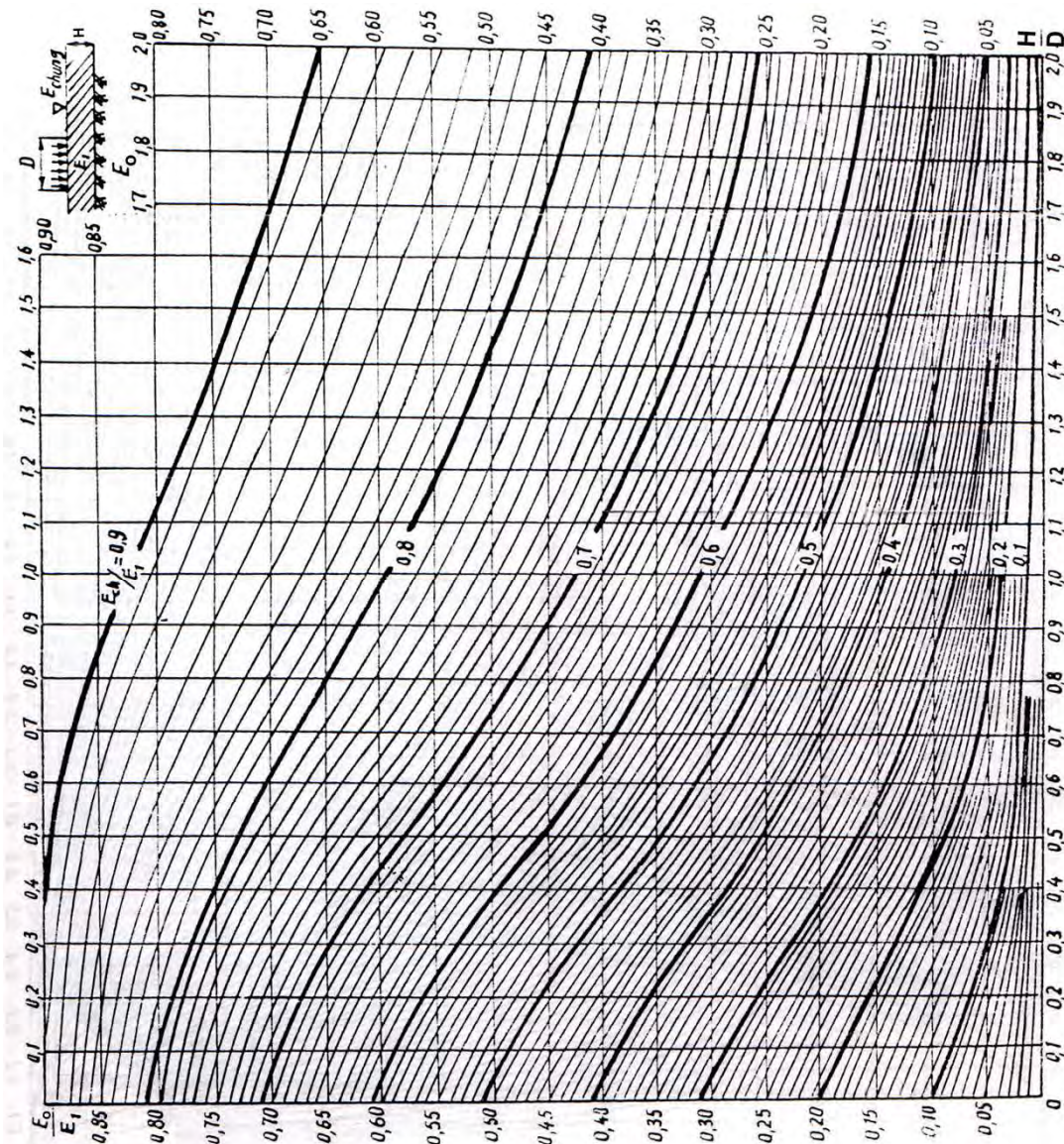


Figure 6.1-5 Monograph for determination of general elastic modulus of double-layer system Ech ($H/D < 2$)

$$E_{ch} = \frac{1.05 \cdot E_0}{1 + \frac{E_0}{E_1}} + \frac{E_0}{\sqrt{1 + 4 \cdot \left(\frac{H}{D}\right)^2 \cdot \left(\frac{E_0}{E_1}\right)^{-0.67}}} \quad (F-1) \quad (H/D > 2)$$

From above Table/Formula, $E_{ch} = 290$ Mpa

$h_1 = 5 \text{ cm} \Rightarrow H/D = 0.1389$
 $E_1 = 1800 \text{ Mpa} \Rightarrow E_1/E_{ch} = 6.2053$

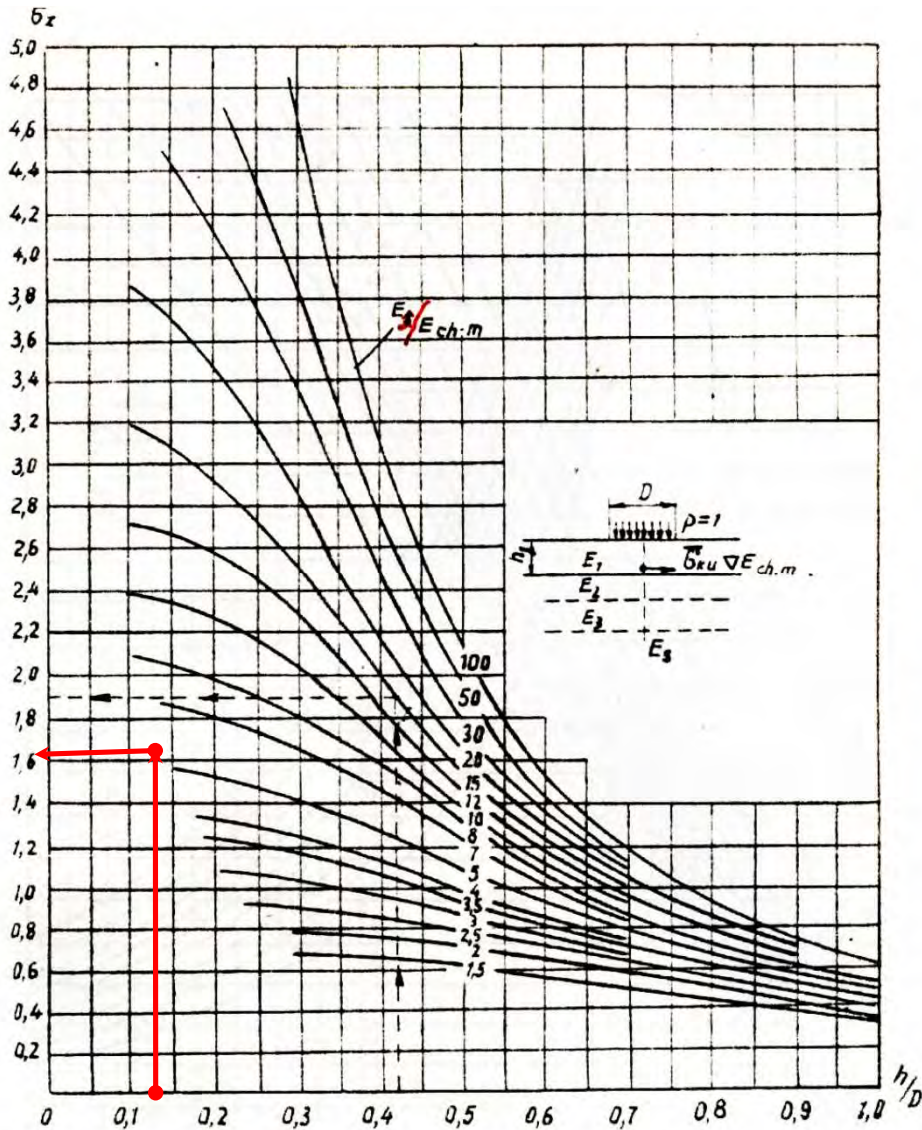


Figure 6.1-6: Monograph determining unit bending and tensile stress σ_{ku} in layers of surface layer

From above Figure,

$\sigma_{ku} = 1.65$

Therefore,

$\sigma_{ku} = \bar{\sigma}_{ku} * p * K_b = 1.65 * 0.60 * 1.00$
 $= 0.99$

And,

$R_{tt}^{ku} = k_1 * k_2 * R_{ku} = 0.40 * 1.00 * 2.80$
 $= 1.13$
 $K_{cd}^{ku} = 0.94$

$\sigma_{ku} \leq \frac{R_{tt}^{ku}}{K_{cd}^{ku}} = \frac{1.13}{0.94} = 1.20 \quad \underline{\underline{OK}}$

B) Cheking of Binder Course

$$\begin{aligned}
 h_1 &= 5 + 14 = 19 \text{ cm} \\
 E_1 &= \frac{1800 * 5 + 1600 * 14}{5 + 14} \\
 &= 1653 \text{ Mpa}
 \end{aligned}$$

E_{tb} = 362 Mpa (from Table D9-1)

β = 1.211 (from below)

$$\begin{aligned}
 E_{TB}^{tt} &= \beta \cdot E_{tb} \\
 &= 1.211 * 362 \\
 &= 438 \text{ Mpa}
 \end{aligned}$$

Table 6.1-17 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$$\beta = 1.114 * (H/D)^{0.12} \quad (\text{in case of } H/D > 2.0) \quad (3-6)$$

Where as;

D = 36 cm (Diameter of Wheel track)

H = 72 cm (Hight of the Layer)

Therefore

H/D = 2.00

From Table/formula 3-6,

$$\begin{aligned}
 \beta &= 1.114 * (72/36)^{0.12} \\
 &= 1.211
 \end{aligned}$$

$E_0 = 50$ Mpa , $E_{TB} = 438$ Mpa
 $E_0/E_{TB} = 0.114$
 $H/D = 2.00$

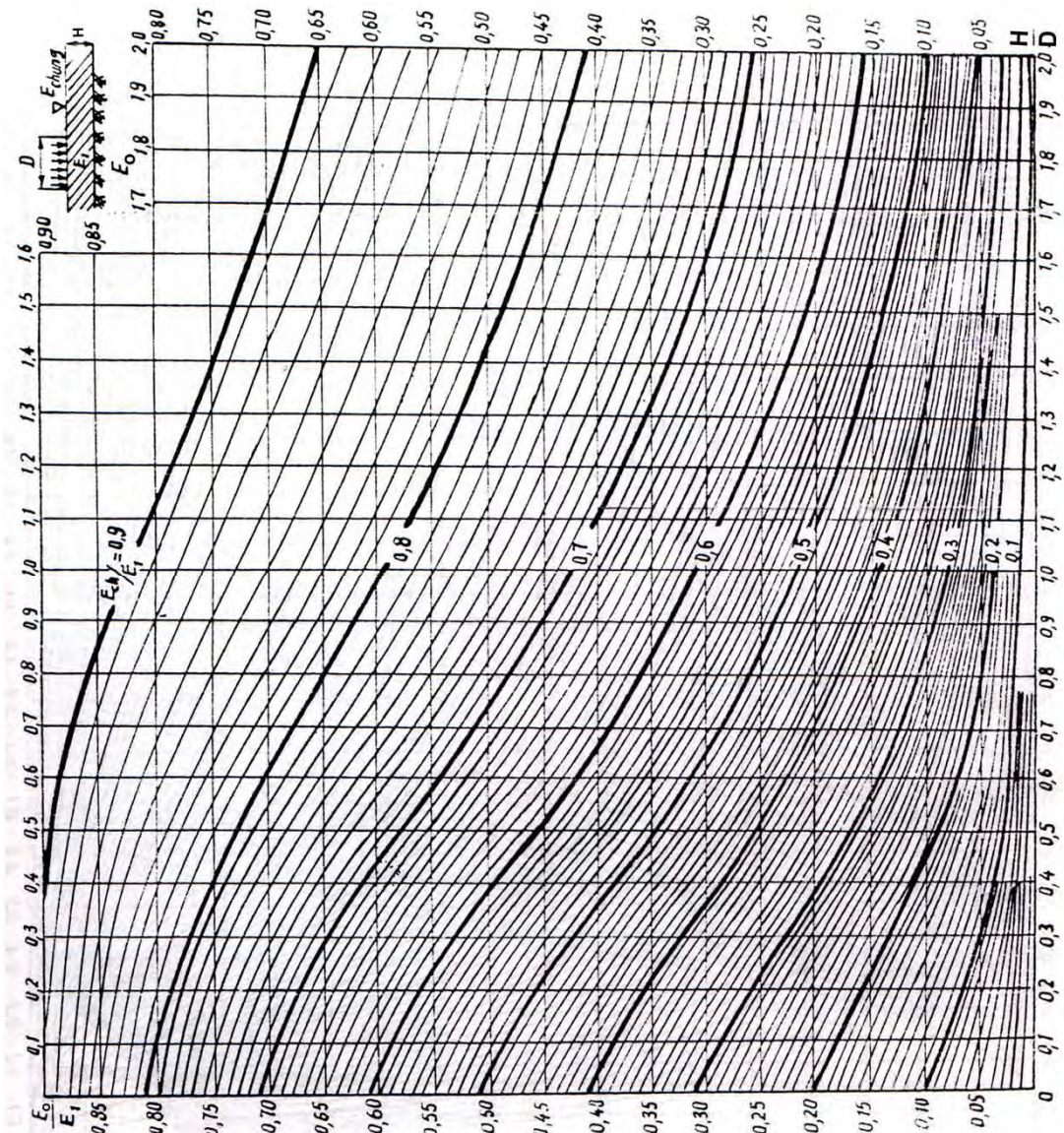


Figure 6.1-7 Monograph for determination of general elastic modulus of double-layer system Ech (H/D<2)

$$E_{ch} = \frac{1.05 \cdot E_0}{1 + \frac{E_0}{E_1}} + \frac{E_0}{\sqrt{1 + 4 \cdot \left(\frac{H}{D}\right)^2 \cdot \left(\frac{E_0}{E_1}\right)^{-0.67}}} \quad (F-1) \quad (H/D > 2)$$

From above Table/Formular, $E_{ch} = 212$ Mpa

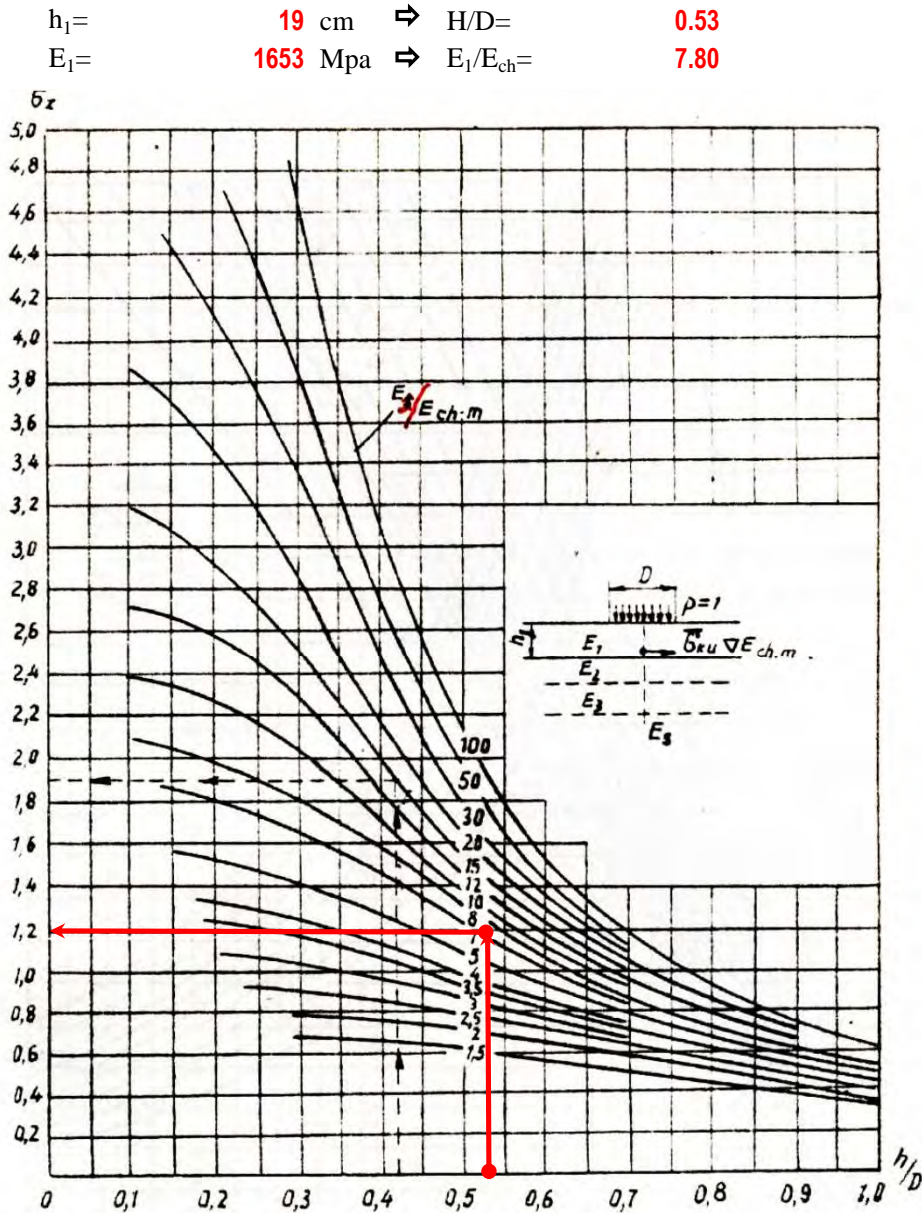


Figure 6.1-8: Monograph determining unit bending and tensile stress σ_{ku} in layers of surface layer

From above Figure,

$$\sigma_{ku} = 1.22$$

Therefore,

$$\sigma_{ku} = \bar{\sigma}_{ku} * p * K_b = 1.22 * 0.60 * 1.00 = 0.73$$

And,

$$R_{tt}^{ku} = k_1 * k_2 * R_{ku} = 0.40 * 1.00 * 2.80 = 1.13$$

$$K_{cd}^{ku} = 0.94$$

$$\sigma_{ku} \leq \frac{R_{tt}^{ku}}{K_{cd}^{ku}} = \frac{1.13}{0.94} = 1.20 \quad \underline{\underline{OK}}$$

6.1.2 RR3

Note: *Table No. and Figure No. is following 22TCN211-06.

D-1. Design Standard:

22TCN 211-06

D-2. Road Category:

Highway (2020 ~ 2035, 15years)

- Characteristics of Standard calculation axle load are as following

Table 6.1-18: Characteristics of Standard calculation axle load

Standard calculation axle load, P_{tt} (kN)	Calculation pressure on pavement, p (Mpa)	Diameter of wheel track, D (cm)
100	0.6	33
120	0.6	36

- From above table,

$$P_{tt} = 120 \text{ kN}$$

$$p = 0.6 \text{ Mpa}$$

$$D = 36 \text{ cm}$$

D-3. Number of Lane:

6-lane

->

$f_l = 0.35$

(f_l ; coefficient from 4-lane to 1-lane)

D-4. Calculation of Vehicle Load

*From Capter2 (Direction 3+4, Dailey Vehicle)

Table 6.1-19 Traffic Volume for each Vehicle type

Section: Tan Vu-Dinh Vu	MC	Car	Truck	Bus
2020	5,980	929	233	129
2025	10,238	5,158	1,587	620
2035	13,308	8,353	3,069	1,704

(Average annual growth rate 2020-2025) = 10.35 %

(Average annual growth rate 2025-2035) = 7.60 %

Types and Number of Trucks & Buses are sporsed as following;

	%	Number
Bus		
(Total)		1,704
- Small Bus	34.0%	579
- Large Bus	66.0%	1,125
Truck		
(Total)		3,069
- Light	47.6%	1,460
- Medium	13.0%	398
- Heavy	0.0%	0
- Heavy	0.0%	0
- Heavy	39.5%	1,211

- Calculation of a number of axles converted into a number of standard axles (Final year of design period)

Table 6.1-20 Calculation of Total Number of axles, N (2035)

Type of Vehicle		P _i (kN)	C1	C2	n _i	C ₁ *C ₂ *n _i *(P _i /P _{tt}) ^{4.4}	<-(3-1)
Small Bus	Front	26.4	1	6.4	579	5	
	Rear	45.2	1	1	579	8	
Large Bus	Front	56.0	1	6.4	1,125	252	
	Rear	95.8	1	1	1,125	418	
Light Truck	Front	18.0	0	6.4	1,460	0	
	Rear	56.0	1	1	1,460	51	
Medium Truck	Front	25.8	1	6.4	398	3	
	Rear	69.6	1	1	398	36	
Heavy Truck	Front	48.2	1	6.4	0	0	
	Rear	100.0	1	1	0	0	
Heavy Truck	Front	45.4	1	6.4	643	57	
	Rear	90.0	2.2	1	643	399	
Heavy Truck	Front	23.1	0	6.4	525	0	
	Rear	73.2	2	1	525	119	
Total					N=	1,348	

*P_{tt} = 120 kN

*Values of P_i, C1, C2 are determined by referring Table E-1

$$N_{tt} = f1 * N = 0.35 * 1,348 = 472 \text{ vehicles/day (2035)} \quad (3-3)$$

- To calculate number of standard axle accumulated in the period of 15 years

$$N_e = \frac{[(1+q)^t - 1]}{q(1+q)^{t-1}} * 365 * N_{tt} \text{ (axles)} \tag{A-3}$$

t1= 5 (years), **q1=** 0.1035 (2020-2025)
t2= 10 (years), **q2=** 0.0760 (2025-2030)
Ntt1= 207 (vehicles/day), (See below calculation) (2020-2025)
Ntt2= 472 (vehicles/day), (See previous page) (2025-2030)

Table 6.1-21 Calculation of Total Number of axles, N (2025)

Type of Vehicle		P _i (kN)	C1	C2	n _i	C ₁ *C ₂ *n _i *(P _i /P _{tt}) ^{4.4}	<-(3-1)
Small Bus	Front	26.4	1.0	6.4	211	2	
	Rear	45.2	1.0	1.0	211	3	
Large Bus	Front	56.0	1.0	6.4	409	92	
	Rear	95.8	1.0	1.0	409	152	
Light Truck	Front	18.0	0.0	6.4	755	0	
	Rear	56.0	1.0	1.0	755	26	
Medium Truck	Front	25.8	1.0	6.4	206	2	
	Rear	69.6	1.0	1.0	206	19	
Heavy Truck	Front	48.2	1.0	6.4	0	0	
	Rear	100.0	1.0	1.0	0	0	
Heavy Truck	Front	45.4	1.0	6.4	332	30	
	Rear	90.0	2.2	1.0	332	206	
Heavy Truck	Front	23.1	0.0	6.4	271	0	
	Rear	73.2	2.0	1.0	271	62	
Total					N=	592	

Ntt(2025)= 592 * 0.35 = 207 (veh/day) (2025)

Therefore,

$$N_e = \frac{[(1+q_1)^{t_1} - 1]}{q_1(1+q_1)^{t_1-1}} * 365 * N_{tt1} + \frac{[(1+q_2)^{t_2} - 1]}{q_2(1+q_2)^{t_2-1}} * 365 * N_{tt2}$$

= 313,724 + 1,265,691 = 1,579,415 (axles)

D-5. Determination of strength coefficient for design reliability and Required elastic modulus value

$$E_{ch} \geq K_{cd}^{dv} * E_{yc} = 1.10 * 188 = 207 \text{ (Mpa)} \quad (3-4)$$

K_{cd}^{dv} : Strength coefficient on deflection depending on reliability
 E_{yc} : Required elastic modulus value

Table 6.1-22: Determination of strength coefficient on deflection depending on reliability

Reliability	0.98	0.95	0.90	0.85	0.80
Strength coefficient K_{cd}^{dv}	1.29	1.17	1.10	1.06	1.02

Table 6.1-23 : Selection of design reliability by road type and class

Road type, class		Design reliability		
1. Expressway		0.90	0.95	0.98
2. Highway/road	-I, II Class	0.00	0.95	0.98
	-III, IV Class	0.85	0.90	0.95
	-V, VI Class	0.80	0.85	0.90
3. Urban road	-Expressway and urban arterial road	0.90	0.95	0.98
	-Other urban road	0.85	0.90	0.95
4. Specialized road		0.80	0.85	0.90

$$K_{cd}^{dv} = 1.10$$

Table 6.1-24 Required elastic modulus value

Types of standard axle load		Required elastic modulus value E_{yc} (Mpa), Corresponding to a number of calculation axles (vehicle/ day/lane)									
		10	20	50	100	200	500	1000	2000	5000	7000
10	High-grade A1			133	147	160	178	192	207	224	235
	High-grade A2		91	110	122	135	153				
	Low-grade B1		64	82	94						
12	High-grade A1		127	146	161	173	190	204	218	235	253
	High-grade A2	90	103	120	133	146	163				
	Low-grade B1		79	98	111						

$$E_{yc} = 173 + (190 - 173) * (472 - 200) / (500 - 200) = 188 \text{ Mpa}$$

D-6. Design Condition

- Material Condition

Table 6.1-25 Material Properties for Each layer

Material	E(Mpa)			R _{ku}	C	φ	t
	Sliding	Deflection	Tensile and Flexure	(Mpa)	(Mpa)	(degree)	(cm)
Surface Course	300	420	1800	2.8			6
Binder Course	350	350	1600	2.0			7
Asphalt Treated Base	350	350	800				10
Base	300	300	300				67
Embankment	41	41	41		0.028	21	-

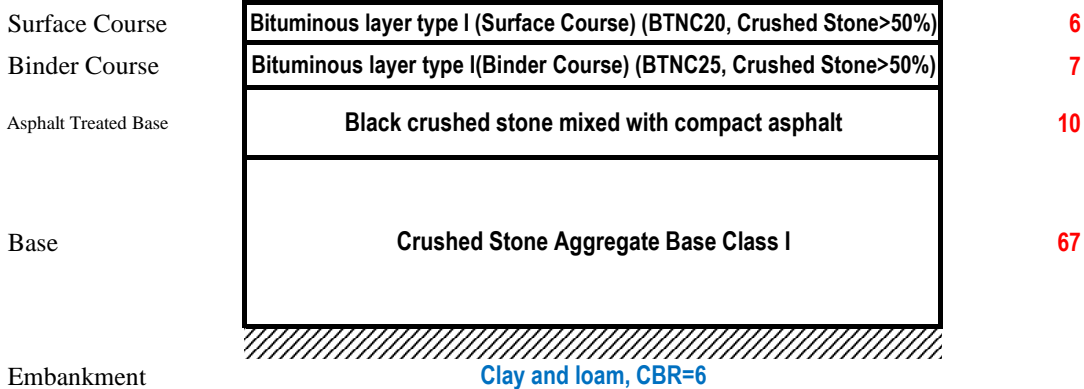
- Surface Course : Bituminous layer type I (Surface Course) (BTNC20, Crushed Stone>50%)
- Binder Course : Bituminous layer type I(Binder Course) (BTNC25, Crushed Stone>50%)
- Asphalt Treated Base : Black crushed stone mixed with compact asphalt
- Base : Crushed Stone Aggregate Base Class I
- Embankment : Clay and loam, CBR=6

Note: *Values of Asphalt and Base were determined by referring to Table C-1
 *E of Embankment was decided by formula B-5, (CBR=6)
 $E=4.68*CBR+12.48=41$ (Mpa)
 *Values of Embankment were determined by referring to Table B-3 ($W/W_{nh}=0.65$)
 *Minimum Asphalt thickness should be 12.5cm. ($N_e > 4.0 * 10^6$) (According to Table 2-2)

Therefore design condition is as following

N_{tt}= 472 (vehicles/lane/day in 2035)
 N_e= 1,579,415 (axle for 15 years)
 P_{tt}= 120 (kN)
 p= 0.60 (Mpa)
 D= 36 (cm)

E_{yc} = 188.413333 (Mpa), K_{cd}^{dv} = 1.1 t(cm)



D-7. Cheking Deflection

No.	$K_{cd}^{dv} \cdot E_{vc} =$	207	Mpa	
4 Surface Course	$E_4 =$	420	Mpa	6 cm
3 Binder Course	$E_3 =$	350	Mpa	7 cm
2 Asphalt Treated Base	$E_2 =$	350	Mpa	10 cm
1 Base	$E_1 =$	300	Mpa	67 cm
	$E_0 =$	41	Mpa	

$$E_{TB} = E_1 \cdot \left[\frac{(1 + k \cdot t^{1/3})}{(1 + k)} \right]^3 \text{ daN Mpa} \quad ; \quad t = \frac{h_1}{h_2} \quad t = \frac{E_2}{E_1} \quad (3-5)$$

The results are described in the below table:

Table 6.1-26 Calculation results of E_{tbi}

Layer	Material Courses	E_i (Mpa)	t $= E_2/E_1$	h_i (cm)	K $= h_2/h_1$	h_{tbi} (cm)	E_{tbi} (Mpa)
4	Surface Course	420	1.36	6	0.07	90	316
3	Binder Course	350	1.14	7	0.09	84	310
2	Asphalt Treated Base	350	1.17	10	0.15	77	306
1	Base	300		67		67	300

$$\begin{aligned}
 E_{tb5} &= \mathbf{316} \text{ daN/cm}^2 \\
 \beta &= \mathbf{1.245} \text{ (from below)} \\
 E_{TB}^{tt} &= \beta \cdot E_{tb} \\
 &= \mathbf{1.245} * \mathbf{316} \\
 &= \mathbf{394} \text{ Mpa}
 \end{aligned}$$

Table 6.1-27 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$$\beta = 1.114 \cdot (H/D)^{0.12} \quad (\text{in case of } H/D > 2.0) \quad (3-6)$$

Where as;

$$\begin{aligned}
 D &= \mathbf{36} \text{ cm} \quad (\text{Diameter of Wheel track}) \\
 H &= \mathbf{90} \text{ cm} \quad (\text{Hight of the Layer})
 \end{aligned}$$

Therefore

$$H/D = \mathbf{2.50}$$

From Table/formula 3-6,

$$\begin{aligned}
 \beta &= 1.114 \cdot (91/36)^{0.12} \\
 &= \mathbf{1.245}
 \end{aligned}$$

$E_0 =$ **41 Mpa** , $E_{TB}^{tt} =$ **394 Mpa**
 $E_0/E_{TB}^{tt} =$ **0.104**
 $H/D =$ **2.50**

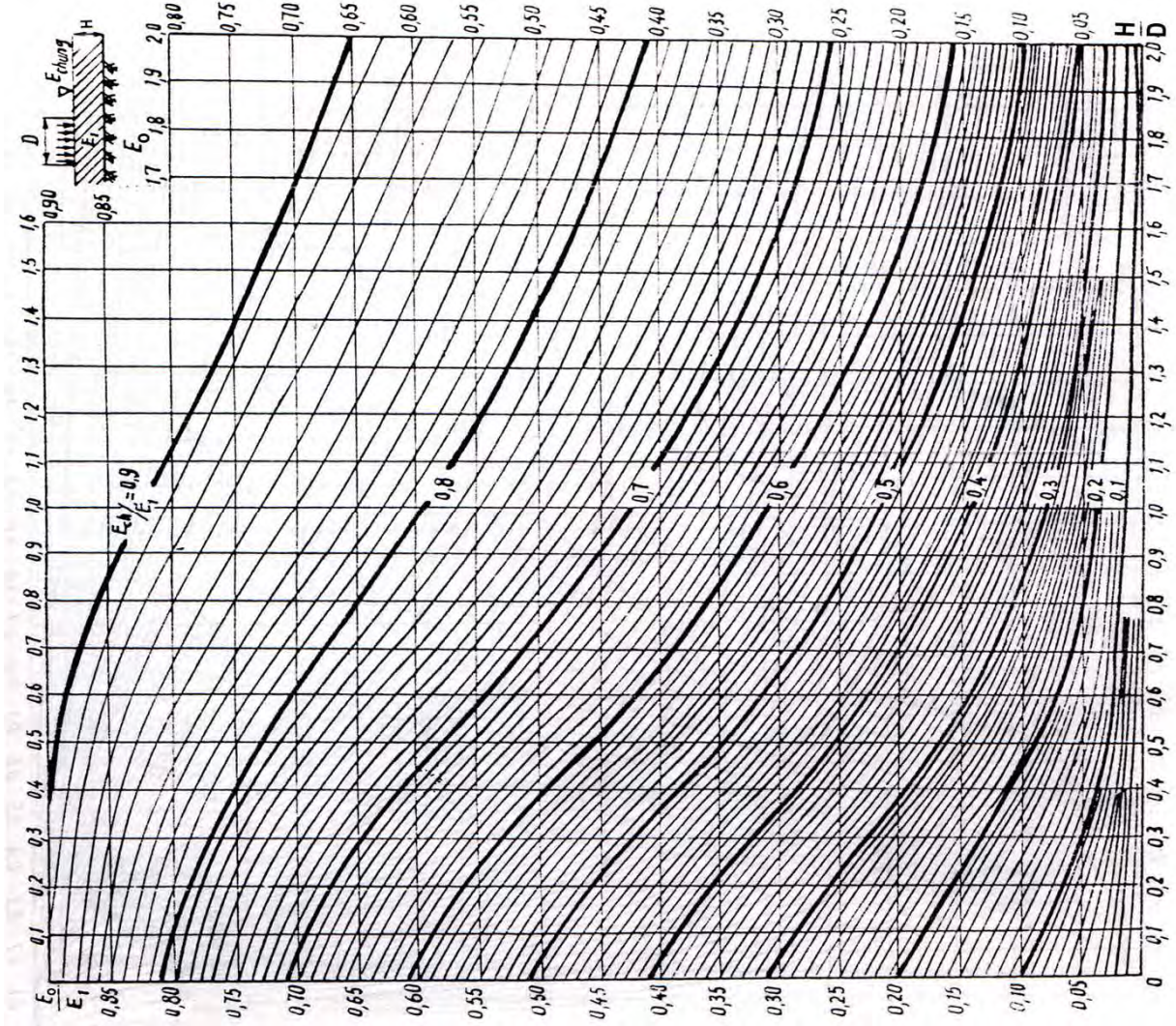


Figure 6.1-8. Monograph for determination of general elastic modulus of double-layer system E_{ch} ($H/D < 2$)

$$E_{ch} = \frac{1.05 \cdot E_0}{1 + \frac{E_0}{E_1}} + \frac{E_0}{\sqrt{1 + 4 \cdot \left(\frac{H}{D}\right)^2 \cdot \left(\frac{E_0}{E_1}\right)^{-0.67}}} \quad (F-1) \quad (H/D > 2)$$

From above Table/Formula, $E_{ch} =$ **208 Mpa** \geq **207 Mpa** ($= K_{cd}^{dv} \cdot E_{yc}$) **OK**

D-8. Cheking Sliding

$$T_{ax} + T_{av} < \frac{C_{tt}}{K_{cd}^{tr}} \quad (3-7)$$

- T_{ax} : From Table 3-2 (H/D<2.0), or From Table 3-3 (H/D >2.0)
- T_{av} : From Table 3-4
- C_{tt} : From formula(3-8)
- K_{cd}^{tr} : From Table 3-7

- Detarmination of K_{cd}^{tr}

$$K_{cd}^{tr} = \underline{0.94} \quad (\text{From Table 3-7})$$

Table 6.1-28 Selection of coefficient of shear strength depending on reliability

Reliability	0.98	0.95	0.90	0.85	0.80
Coef. K_{cd}^{tr}	1.10	1.00	0.94	0.90	0.87

- Calculation of C_{tt}

$$C_{tt} = C * K_1 * K_2 * K_3 = \underline{0.0202} \text{ (Mpa)}$$

- C: **0.028** (Mpa) Cohesive force of fundation soil
- K₁: **0.6** for pavement carriageway
- K₂: **0.8** from Table 3-8

Table 6.1-29 Determination of Coefficient K2 depending on a number of design axles

A number of design axles (N_{tt}) (axle/day/lane)	Under 100	Under 1000	Under 5000	Over 5000
Coefficient K₂	1.00	0.80	0.65	0.60

*N_{tt}= 472

- K₃: **1.5** For types of cohesive soil (clay, clay loam, clay sand etc.)

No.	$C_{tt}/K_{cd}^{tr} =$	0.021	
4 Surface Course	$E_4 =$	300	Mpa
3 Binder Course	$E_3 =$	350	Mpa
2 Asphalt Treated Base	$E_2 =$	350	Mpa
1 Base	$E_1 =$	300	Mpa

$E_0 =$	41	Mpa
$C =$	0.028	Mpa
$\varphi =$	21	degree

- Determination of T_{ax}

Table 6.1-30 Calculation results of E_{tbi}

Layer	Material Courses	E_i (Mpa)	t $=E_2/E_1$	h_i (cm)	K $=h_2/h_1$	h_{tbi} (cm)	E_{tbi} (Mpa)
4	Surface Course	300	0.97	6	0.07	90	309
3	Binder Course	350	1.14	7	0.09	84	310
2	Asphalt Treated Base	350	1.17	10	0.15	77	306
1	Base	300		67		67	300

$$E_{tb} = 309 \text{ daN/cm}^2$$

$$\beta = 1.245 \text{ (from below)}$$

$$E_{TB}^{tt} = \beta \cdot E_{tb}$$

$$= 1.245 * 309$$

$$= 385 \text{ Mpa}$$

Table 6.1-31 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$$\beta = 1.114 * (H/D)^{0.12} \quad (\text{in case of } H/D > 2.0) \quad (3-6)$$

Where as;

$$D = 36 \text{ cm} \quad (\text{Diameter of Wheel track})$$

$$H = 90 \text{ cm} \quad (\text{Hight of the Layer})$$

Therefore

$$H/D = 2.50$$

From Table/formula 3-6,

$$\beta = 1.114 * (91/36)^{0.12}$$

$$= 1.245$$

$E_0 = 41 \text{ Mpa}$, $E_{TB} = 385 \text{ Mpa}$
 $E_{TB} / E_0 = 9.39$
 $H/D = 2.50$, $\varphi = 21 \text{ degree}$

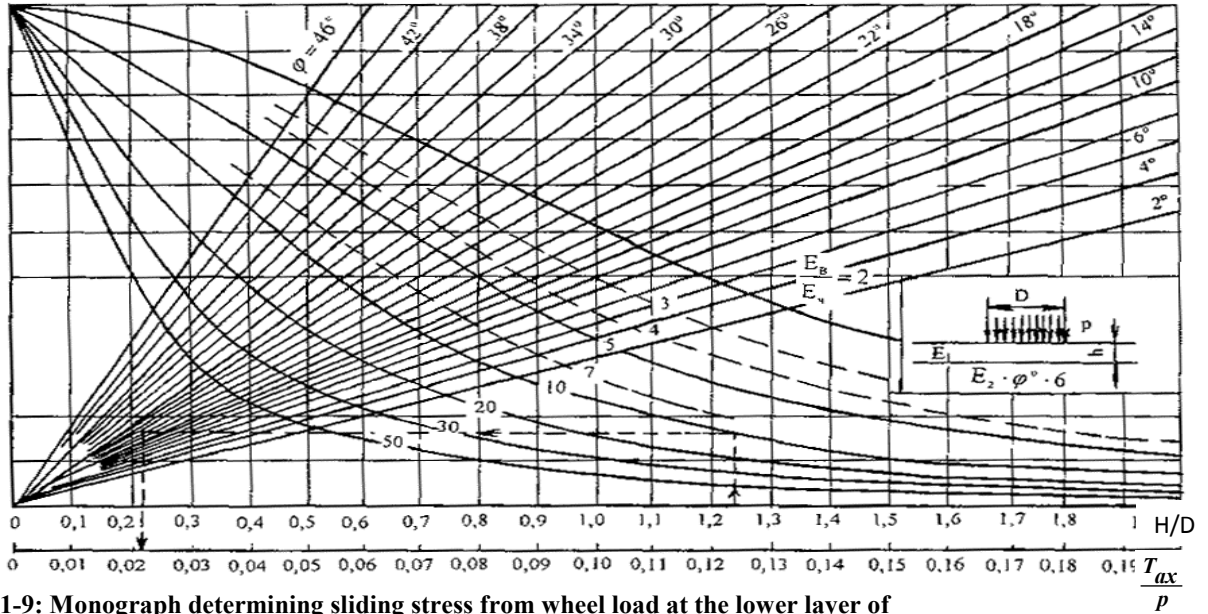


Figure 6.1-9: Monograph determining sliding stress from wheel load at the lower layer of the double-layer system ($H/D = 0 \sim 2$)

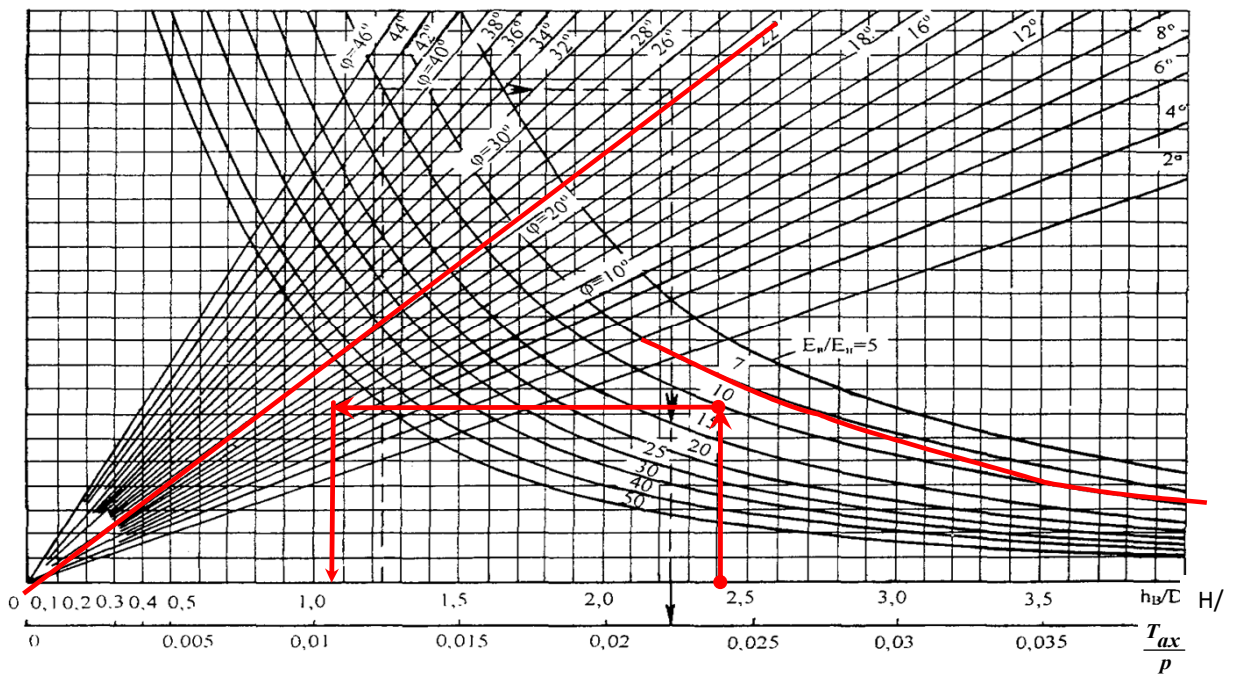


Figure 6.1-10: Monograph determining sliding stress from wheel load at the lower layer of the double-layer system ($H/D = 0 \sim 4$)

From above Figure, $T_{ax}/p = 0.009$, $p = 0.60 \text{ Mpa}$
 Therefore $T_{ax} = 0.0054 \text{ Mpa}$

- Determination of T_{av}

H= **90 cm**
 ϕ = **21 degree**

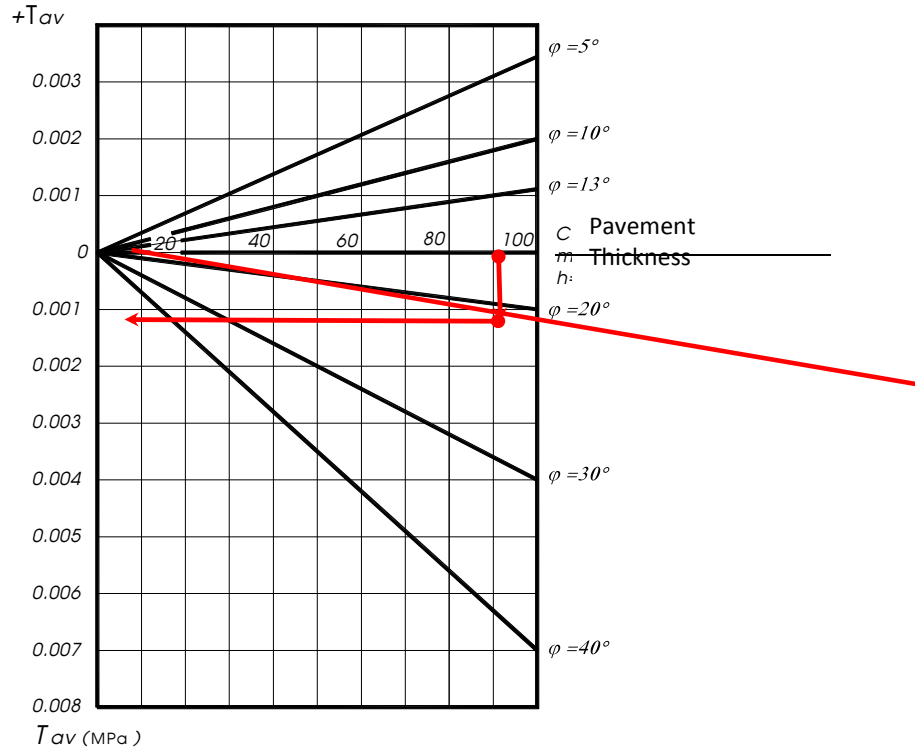


Figure 6.1-11. Monograph for finding active shearing stress T_{av} by self weight of pavement

From above Figure,

$T_{ax} =$ **-0.0011** Mpa

- Cheking Sliding

$$T_{ax} + T_{av} < \frac{C_{tt}}{K_{cd}^{tr}} \quad (3-7)$$

$T_{ax} =$ **0.0054** Mpa

$T_{av} =$ **-0.0011** Mpa

$C_{tt} =$ **0.0202** Mpa

$K_{cd}^{tr} =$ **0.94** Mpa

$$T_{ax} + T_{av} = 0.0054 + (-0.0011) = 0.0043$$

$$C_{tt}/K_{cd}^{tr} = 0.0202 / 0.94 = 0.0214$$

$T_{ax} + T_{av} < C_{tt}/K_{cd}^{tr}$ **OK**

D-9. Cheking Flexural Strength

$$\sigma_{ku} \leq \frac{R_{tt}^{ku}}{K_{cd}^{ku}} \quad (3-9)$$

$$\sigma_{ku} = \sigma_{ku} \cdot \overline{p} \cdot K_b \quad (3-10)$$

σ_{ku} : the value shall be determined by Figure 3-5, 3-6, (See after)

p : = **0.60** Mpa

K_b = **1.00** (for the heaviest special axle load)

$$R_{tt}^{ku} = k_1 \cdot k_2 \cdot R_{ku} \quad (3-11)$$

$$k_1 = 11.11 / N_e^{0.22} \quad (\text{for asphalt concrete material}) \quad (3-12)$$

$$= 11.11 / 1,579,415^{0.22} = \underline{\underline{0.48}}$$

$$N_e = 1,579,415 \text{ (axle for 15 years)}$$

$$k_2 = 1.00 \text{ (for material consolidated with inorganic material)}$$

$$R_{ku} = 2.80 \text{ (for Surface Course, See D-7 Design Condition)}$$

$$2.00 \text{ (for Binder Course, See D-7 Design Condition)}$$

$$K_{cd}^{ku} = 0.94 \quad (\text{From Table 3-7})$$

- Design Condition

No.

4 Surface Course	$E_4 =$	1800	Mpa	6	cm
3 Binder Course	$E_3 =$	1600	Mpa	7	cm
2 Asphalt Treated Base	$E_2 =$	800	Mpa	10	cm
1 Base	$E_1 =$	300	Mpa	67	cm
		$E_0 =$	41	Mpa	

Table 6.1-32 Calculation results of E_{tbi}

Layer	Material Courses	E_i (Mpa)	t $=E_2/E_1$	h_i (cm)	K $=h_2/h_1$	h_{tbi} (cm)	E_{tbi} (Mpa)
4	Surface Course	1800	4.41	6	0.07	90	463
3	Binder Course	1600	4.60	7	0.09	84	408
2	Asphalt Treated Base	800	2.67	10	0.15	77	348
1	Base	300		67		67	300

A) Cheking of Surface Course

$h_1 =$ **6** cm, $E_1 =$ **1800** Mpa

$E_{tb4} =$ **408** Mpa (from Table D9-1)

$\beta =$ **1.233** (from below)

$E_{TB}^{tt} = \beta \cdot E_{tb}$

$=$ **1.233** * **408**

$=$ **504** Mpa

Table 6.1-33 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$\beta = 1.114 \cdot (H/D)^{0.12}$ (in case of $H/D > 2.0$) (3-6)

Where as;

$D =$ **36** cm (Diameter of Wheel track)

$H =$ **84** cm (Hight of the Layer)

Therefore

$H/D =$ **2.33**

From Table/formula 3-6,

$\beta = 1.114 \cdot (84/36)^{0.12}$

$=$ **1.233**

$E_0 =$ **41** Mpa , $E_{TB}^{tt} =$ **504** Mpa
 $E_0/E_{TB}^{tt} =$ **0.081**
 $H/D =$ **2.33**

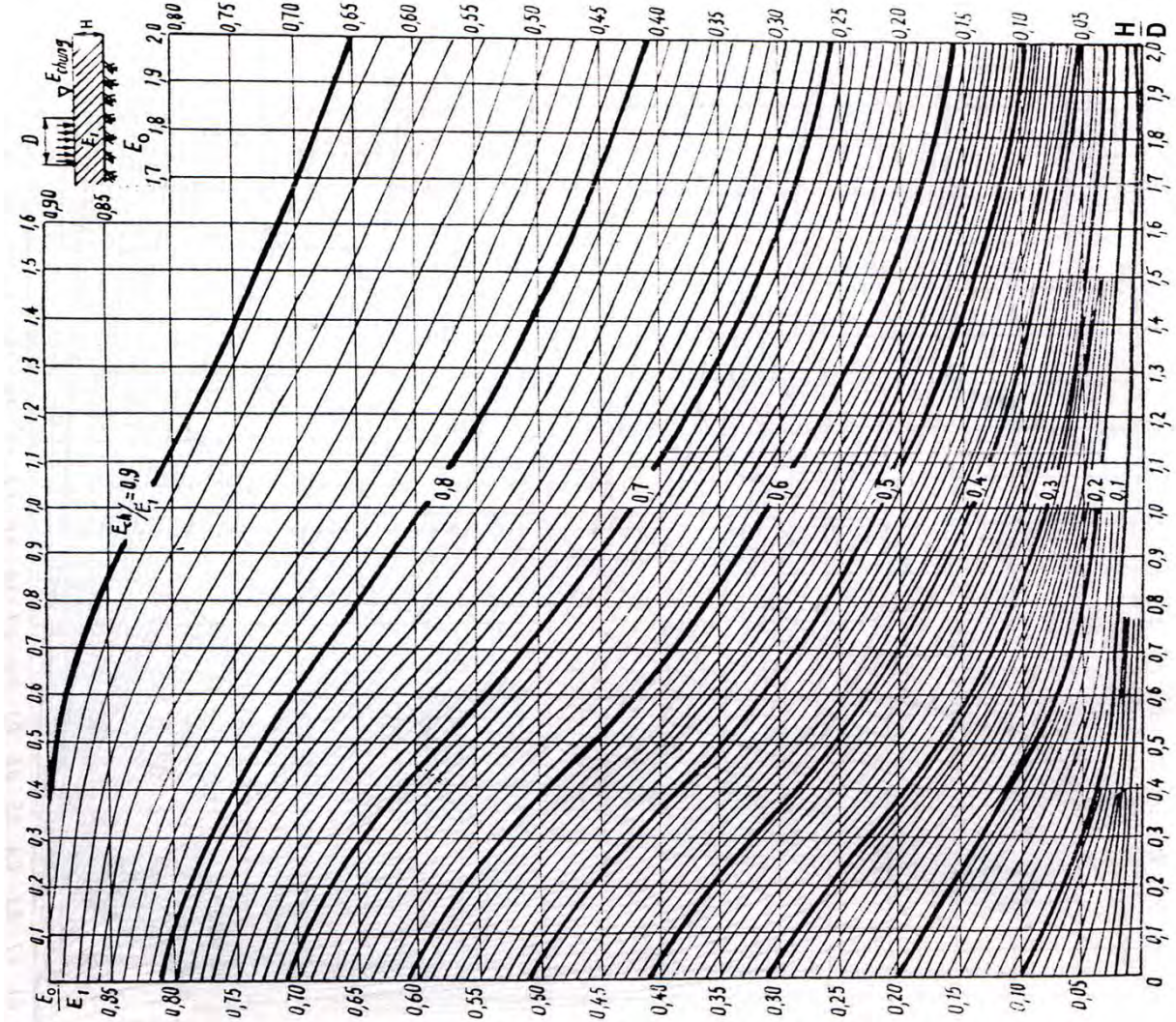


Figure 6.1-12. Monograph for determination of general elastic modulus of double-layer system E_{ch} ($H/D < 2$)

$$E_{ch} = \frac{1.05 \cdot E_0}{1 + \frac{E_0}{E_1}} + \frac{E_0}{\sqrt{1 + 4 \cdot \left(\frac{H}{D}\right)^2 \cdot \left(\frac{E_0}{E_1}\right)^{-0.67}}} \quad (F-1) \quad (H/D > 2)$$

From above Table/Formula, $E_{ch} =$ **238** Mpa

$h_1 = 6 \text{ cm} \Rightarrow H/D = 0.1667$
 $E_1 = 1800 \text{ Mpa} \Rightarrow E_1/E_{ch} = 7.5675$

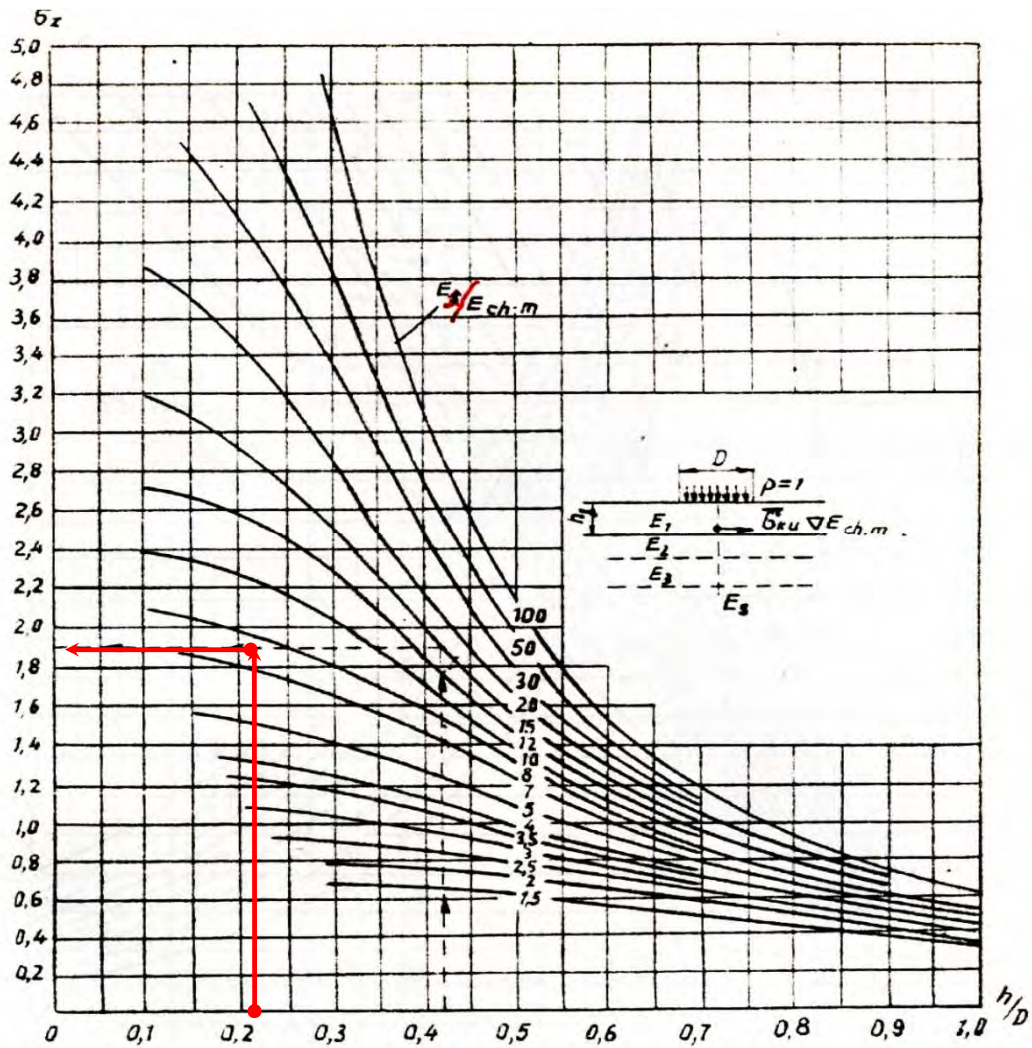


Figure 6.1-13: Monograph determining unit bending and tensile stress σ_{ku} in layers of surface layer

From above Figure,

$\sigma_{ku} = 1.92$

Therefore,

$\sigma_{ku} = \sigma_{Ku} * p * K_b = 1.92 * 0.60 * 1.00$
 $= 1.15$

And,

$R_{tt}^{ku} = k_1 * k_2 * R_{ku} = 0.48 * 1.00 * 2.80$
 $= 1.35$
 $K_{cd}^{ku} = 0.94$

$\sigma_{ku} \leq \frac{R_{tt}^{ku}}{K_{cd}^{ku}} = \frac{1.35}{0.94} = 1.43 \quad \underline{\underline{OK}}$

B) Cheking of Binder Course

$$\begin{aligned}
 h_1 &= 6 + 7 = 13 \text{ cm} \\
 E_1 &= \frac{1800 * 6 + 1600 * 7}{6 + 7} \\
 &= 1692 \text{ Mpa}
 \end{aligned}$$

E_{tb4} = 348 Mpa (from Table D9-1)

β = 1.220 (from below)

E_{TB}^u = β · E_{tb}

= 1.220 * 348

= 424 Mpa

Table 6.1-34 Adjustment coefficient β

H/D Ratio	0.51	0.75	1.00	1.25	1.50	1.75	2.00
β Coefficient	1.033	1.069	1.107	1.136	1.178	1.198	1.210

$\beta = 1.114 * (H/D)^{0.12}$ (in case of H/D > 2.0) (3-6)

Where as;

D = 36 cm (Diameter of Wheel track)

H = 77 cm (Hight of the Layer)

Therefore

H/D = 2.14

From Table/formula 3-6,

$\beta = 1.114 * (77/36)^{0.12}$

= 1.220

$E_0 =$ **41** Mpa , $E_{TB}^{tt} =$ **424** Mpa
 $E_0/E_{TB}^{tt} =$ **0.097**
 $H/D =$ **2.14**

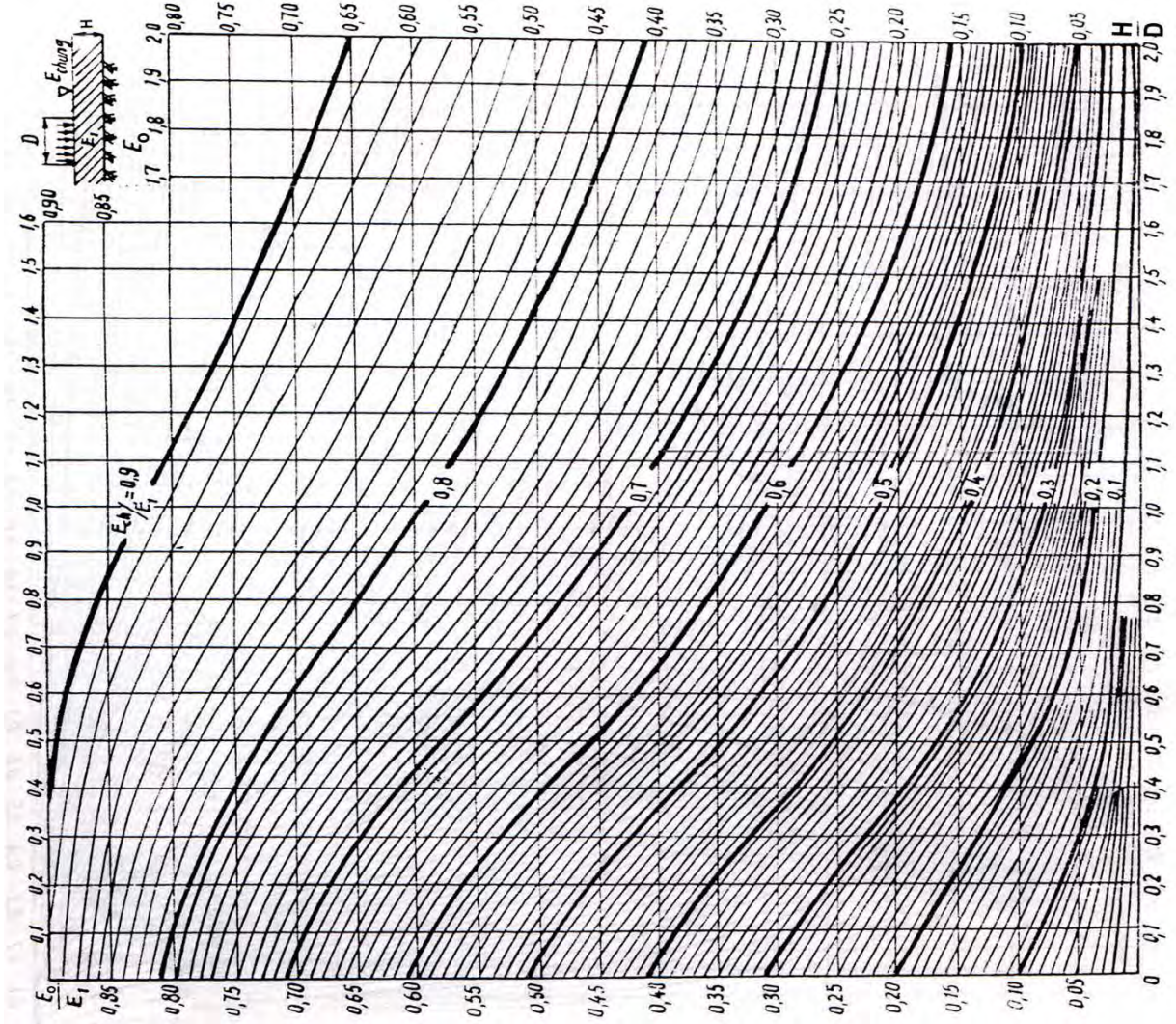


Figure 6.1-14. Monograph for determination of general elastic modulus of double-layer system E_{ch} ($H/D < 2$)

$$E_{ch} = \frac{1.05 \cdot E_0}{1 + \frac{E_0}{E_1}} + \frac{E_0}{\sqrt{1 + 4 \cdot \left(\frac{H}{D}\right)^2 \cdot \left(\frac{E_0}{E_1}\right)^{-0.67}}} \quad (F-1) \quad (H/D > 2)$$

From above Table/Formula, $E_{ch} =$ **202** Mpa

$h_1 = 13 \text{ cm} \Rightarrow H/D = 0.36$
 $E_1 = 1692 \text{ Mpa} \Rightarrow E_1/E_{ch} = 8.38$

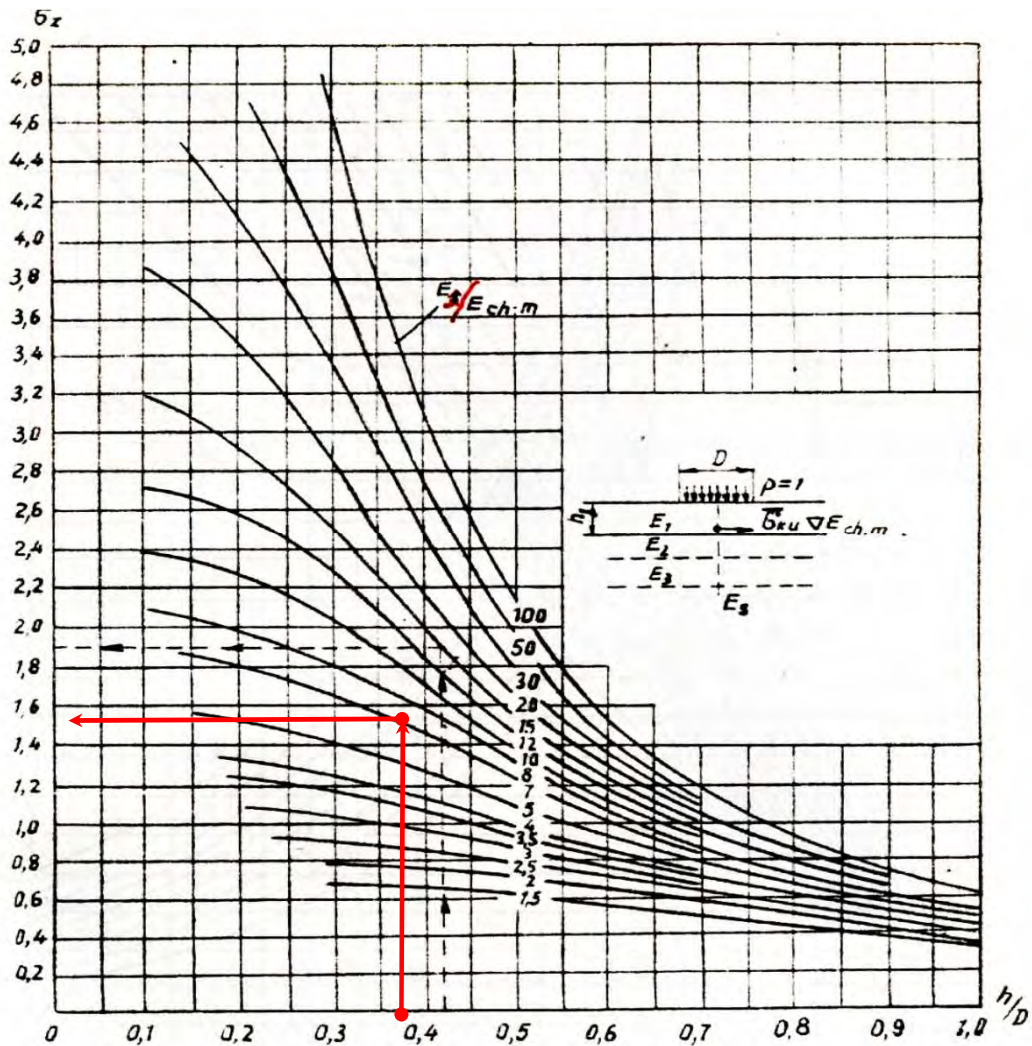


Figure 6.1-15: Monograph determining unit bending and tensile stress σ_{ku} in layers of surface layer

From above Figure,

$\sigma_{ku} = 1.58$

Therefore,

$\sigma_{ku} = \sigma_{Ku} \cdot p \cdot K_b = 1.58 \cdot 0.60 \cdot 1.00 = 0.95$

And,

$R_{tt}^{ku} = k_1 \cdot k_2 \cdot R_{ku} = 0.48 \cdot 1.00 \cdot 2.80 = 1.35$
 $K_{cd}^{ku} = 0.94$

$\sigma_{ku} \leq \frac{R_{tt}^{ku}}{K_{cd}^{ku}} = \frac{1.35}{0.94} = 1.43 \quad \underline{\text{OK}}$

6.2 Soft ground treatment, Result of Analysis

(1) Representative Sections for analysis

The representative sections for analysis are selected based on the height of embankment and results of geotechnical investigation.

Table 6.2-1 Sections for analysis

Section	Location	Height of embankment (m)	Borehole	Note
1	No 54 + 0.000	7.50	BH RR 04	
2	No 19 + 0.000	2.00	BH RR 02	No Undisturbed sample
3	Vu Yen Bridge No 135+0.000	4.5	BH VY 06	

(2) Design criteria

The adjustment of analysis follows Vietnam standard: “22TCN – 262 – Embankment Design on Soft Soil Foundation”. Assuming the opening time for Project is 365 days after finishing the earthwork, the residual settlement at road center when opening shall be as follows:

Table 6.2-2 Residual Settlement at Road Center

Road Type	Location near Abutments	Location near drainage system	Normal Embankment
Expressway (V >80 m/h)	≤ 10 cm	≤ 20 cm	≤ 30 cm
Highway (V >60 km/h)	≤ 20 cm	≤ 30 cm	≤ 40 cm

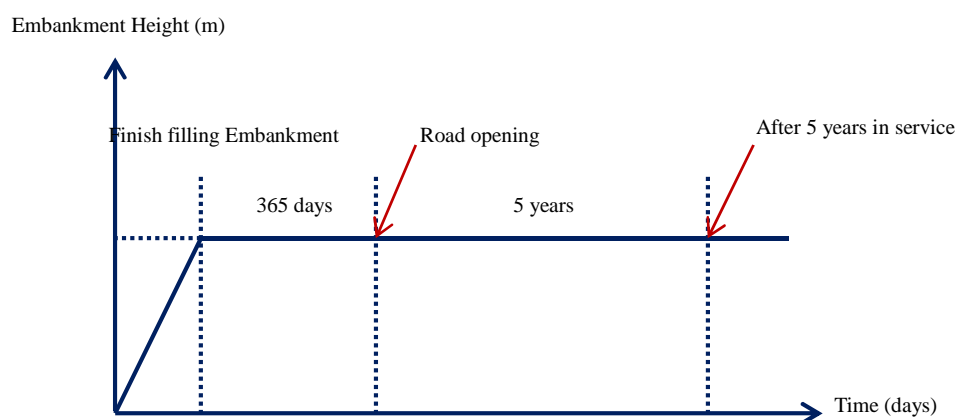


Figure 6.2-1 Residual Settlement at Road Center

(3) Embankment parameters

Table 6.2-3 Embankment parameters

Soil Type	Unit weight (kN/m ³)	Cohesion (kPa)	Friction angle (degree)	Construction velocity (cm/day)
Cohesive soil	18	90	0	5

(4) Soil parameters

Soil parameters for each section are presented in following tables:

1) Section 1

Table 6.2-4 Mechanical Physical Properties

Soil layer	Thickness (m)	Average SPT N	Unit weight γ (kN/m ³)	Moisture content W (%)	Cohesion (kPa)	Friction angle (degree)
Stiff Clay	4.5	5	18	-	-	-
Soft Silt	4.8	-	18	40	-	-
Stiff Clay	7.6	5	18	-	-	-
Bedrock	3.1	50	19	-	-	-

Consolidation Property

Table 6.2-5 e- log P Curve

Clay								
Consolidation stress P (kPa)	12.5	25	50	100	200	400	800	
Void ratio e	0.843	0.833	0.814	0.786	0.746	0.693	0.616	
Silt								
Consolidation stress P (kPa)	12.5	25	50	100	200	400	800	
Void ratio e	1.407	1.377	1.325	1.248	1.151	1.024	0.873	

Table 6.2-6 Log Cv – log P Curve

Clay							
Consolidation stress P (kPa)	25	50	100	200	400	800	
Coefficient of consolidation Cv (cm ² /day)	204.81	176.52	234.17	226.73	260.74	291.94	
Silt							
Consolidation stress P (kPa)	25	50	100	200	400	800	
Coefficient of consolidation Cv (cm ² /day)	50.35	49.50	55.87	50.41	47.89	57.76	

2) Section 2

Table 6.2-7 Mechanical Physical Properties

Soil layer	Thickness (m)	Average SPT N	Unit weight γ (kN/m ³)	Moisture content W (%)	Cohesion (kPa)	Friction angle (degree)
Soft Silt	9.6	-	18	-	-	-
Stiff Silt	2.4	-	18	-	-	-
Dense Sand	5.0	19	18	-	-	-

Consolidation Property

Table 6.2-8 e- log P Curve

Soft Silt							
Consolidation stress P (kPa)	12.5	25	50	100	200	400	800
Void ratio e	0.843	0.833	0.814	0.786	0.746	0.693	0.616
Stiff Silt							
Consolidation stress P (kPa)	12.5	25	50	100	200	400	800
Void ratio e	1.407	1.377	1.325	1.248	1.151	1.024	0.873

Table 6.2-9 Log Cv – log P Curve

Soft Silt						
Consolidation stress P (kPa)	25	50	100	200	400	800
Coefficient of consolidation Cv (cm ² /day)	204. 81	176. 52	234. 17	226. 73	260. 74	291. 94
Stiff Silt						
Consolidation stress P (kPa)	25	50	100	200	400	800
Coefficient of consolidation Cv (cm ² /day)	50.35	49.50	55.87	50.41	47.89	57.76

3) Section 3

Table 6.2-10 Mechanical Physical Properties

Soil layer	Thickness (m)	Average SPT N	Unit weight γ (kN/m ³)	Moisture content W (%)	Cohesion (kPa)	Friction angle (degree)
Soft Clay	5.00	0	16.0	48.10	-	-
Soft Silt	6.30	0	17.0	47.53	-	-
Hard Clay	4.30	9	18.0	30.0	-	-

Consolidation Property

Table 6.2-11 e- log P Curve

Soft Clay							
Consolidation stress P (kPa)	12.5	25	50	100	200	400	800
Void ratio e	1.361	1.300	1.206	1.081	0.959	0.827	0.686
Soft Silt							
Consolidation stress P (kPa)	12.5	25	50	100	200	400	800
Void ratio e	1.321	1.287	1.218	1.100	0.972	0.838	0.695

Table 6.2-12 Log Cv – log P Curve

Soft Clay						
Consolidation stress P (kPa)	25	50	100	200	400	800
Coefficient of consolidation Cv (cm ² /day)	84.93	70.33	75.51	84.67	94.52	123.98
Soft Silt						
Consolidation stress P (kPa)	25	50	100	200	400	800
Coefficient of consolidation Cv (cm ² /day)	194.23	166.49	178.68	225.33	276.91	269.22

(5) Ground water level**Table 6.2-13 Ground Water Level**

Location (m) (Below ground surface)	Unit weight (kN/m ³)
-1.0	10

(6) Traffic load**Table 6.2-14 Traffic Load**

Traffic load (kPa)	Start Loading time
10	Road opening

(7) Outputs

Analysis results are presented in Table 6.1-22 including:

- Slope stability (Bishop) Min FS
- Residual settlement (Without PVD)
- Residual settlement (With PVD)

Table 6.2-15 Analysis Results

Embankment height (m)	Construction velocity (m/day)	Embankment Construction time (days)	No of Geotextile layer	Slope Stability Min FS	Output time (days)		Total settlement (m)	Allowable residual settlement (cm)	Without PVD	
					Road opening				Residual settlement	Road opening (cm)
Section 1										
7.50	0.05	150	0	2.296	515	66.94	20.00	45.985	NG	
Section 2										
2.00	0.05	40	0	2.083	405	33.54	30.00	24.492	OK	
Section 3										
4.50	0.05	90	0	1.872	455	103.51	30.00	59.45	NG	

Embankment height (m)	PVD length (m)	With PVD					Note
		Pattern	Pitch (m)	Construction time (days)	Residual settlement (m)	Degree of consolidation %	
Section 1							
7.50	9.00	Square	1.50	525	8.38	87.50	At road center
Section 2							
2.00	-	-	-	-	-	-	At road center
Section 3							
4.50	5.00	Square	1.50	525.00	14.23	86.25	At road center

(8) Conclusion

In case of embankment height is more than 5m, it is compulsory to apply soft soil treatment since the residual settlement at road center without improvement is more than 10 cm. The recommended method is Prefabricated Vertical Drain (PVD) with 9 m – 10 m in length depending on location and state of soft soil (from soft to very soft). The number of PVD installation for each section for a cross – section is shown in table 6.1-16.

Table 6.2-16 The Number of PVD Installation for Sections

Section	Pattern	Spacing (m)	Length (m)
Section 1	Square	1.5 x 1.5	10.0 (9.0)
Section 3 (Vu Yen Bridge)	Square	1.5 x 1.5	5.0

For normal embankment (2m height in average), the residual settlement is less than 30 cm, soft soil treatment is not necessary to apply.

In Detailed Design Stage, soft soil improvement method should be re-evaluated based on the more fruitful data of geotechnical investigations.

(9) Schedule of soft ground treatment (PVD)

Table 6.2-17 Schedule of Soft Ground Treatment

Main Location	Area		Length	PVD Pitch	PVD Depth	Height
1 Box1	No 80+17.000	No 81+50.000	133.000 m	1.5m x 1.5m	5m	4m < h < 5m
2 Box2	No 111+34.000	No 114+00.000	266.000 m	1.5m x 1.5m	5m	4m < h < 5m
3 RuotLon Br	No 124+75.000	No 125+15.000	40.000 m	1.5m x 1.5m	5m	4m < h < 5m
	No 125+15.000	No 125+80.350	65.350 m	1.5m x 1.5m	10m	5m < h
	No 131+59.650	No 132+06.660	47.010 m	1.5m x 1.5m	10m	5m < h
	No 132+06.660	No 132+55.000	48.340 m	1.5m x 1.5m	5m	4m < h < 5m
4 Vu Yen Island	No 132+55.000	No 143+56.500	1,101.500 m	1.5m x 1.5m	5m	4m < h < 5m

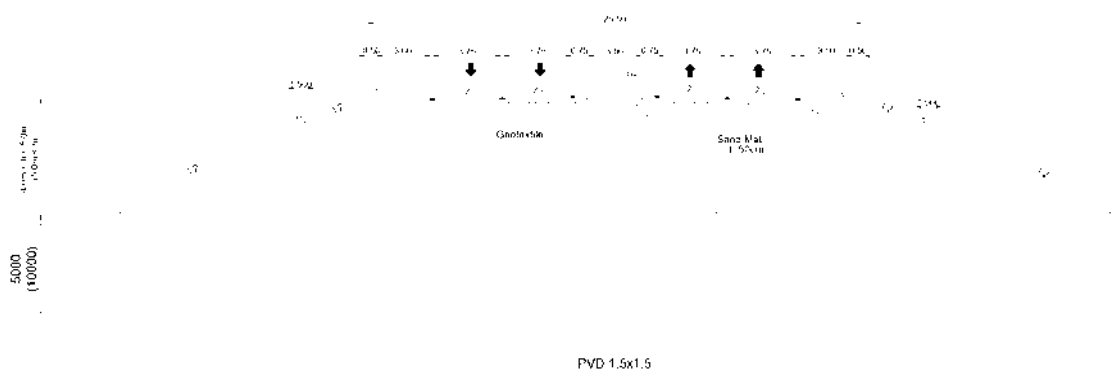


Figure 6.2-2 Typical Cross Section of Soft Ground Treatment

6.3 Binh Bridge

Binh Bridge which is maintained by the Hai Phong Bridge Projects Management Department (HPBMD hereinafter) was investigated at the site and the results are shown below. At present there are not any maintenance problems. The pavement over the bridge is in good condition, partly due to the lower traffic volume compared to Kien Bridge.

Binh Bridge



Binh Bridge (100m + 260m + 100m)



Binh Bridge has 4 lanes and a wide pedestrian walkway, about 4m wide.



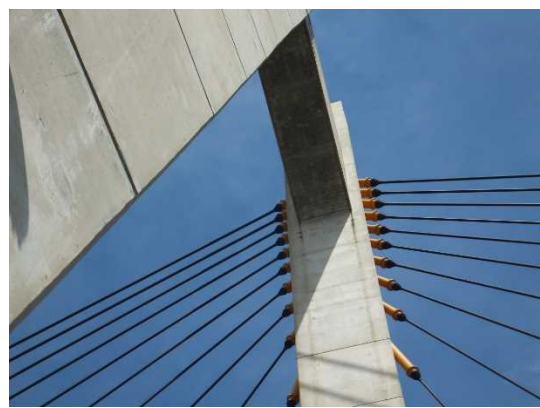
Expansion joint on the bridge.



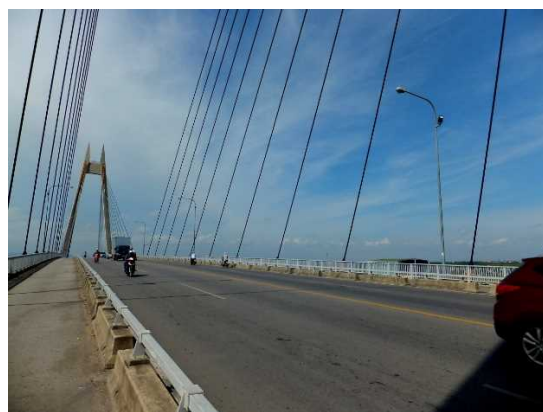
Binh Bridge. The road is wide and there are not so many heavy trucks.



Binh Bridge was opened in May 2005.



Concrete tower and cables.

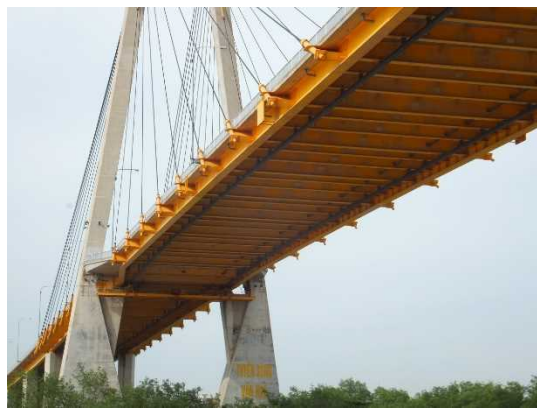
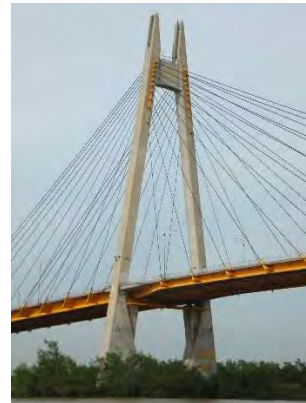


At about 4:00 PM, the bridge was not congested. Pavement is good condition.



The south approach of Binh Bridge. The vertical gradient is 4%, which is the same as Kien Bridge.

Binh Bridge seen from the river



Some lime was confirmed but sever damage was not observed in slab.

6.4 Kien Bridge

The present condition of Kien Bridge was investigated on site. The approach gradient of the bridge is 4% which is the same as that of Binh Bridge. Kien Bridge has only two lanes and a large number of heavy vehicles pass the bridge every day. The vehicles always run over the same part of the bridge because it only has two lanes. Since the vehicles are heavier and always run over the same part, the conditions for the pavement are much harsher than those of Binh Bridge. This is probably one of the reasons for the more rapid deterioration of the pavement of Kien Bridge. After Kien Bridge was opened in September 2003, the pavement deteriorated rapidly. In November 2014, the road surface of the bridge was repaved. When the bridge was inspected in June 2015 by the study team, the pavement conditions were still good. However, the heavy traffic concentrated on one lane may result in earlier deterioration of the pavement. The inspection results are shown below.

Kien Bridge



Pavement conditions of Kien Bridge in September 2014. Source: <http://www.baohaiphong.com.vn/> <03/09/2014>



Repavement of Kien Bridge, November 2014 Source: <http://www.baohaiphong.com.vn/> <03/09/2014>

Since the pavement conditions of Kien Bridge were as bad as shown above, the bridge surface was repaved in November 2014. Although the present condition of the pavement is not so bad as can be seen on the right, surface unevenness has already appeared (south side).



Unevenness has already appeared after repavement about 6 months earlier.



Heavy trucks keep passing on the bridge.



Heavy trucks keep passing on the bridge.



Surface unevenness has already appeared (north side).



As heavy trucks are slower, traffic congestion is common. The vertical gradient of the bridge is 4%.



The bridge was opened in September 2003.



All of the expansion joints on Kien Bridge were replaced. The reason is unknown.



The expansion joints have been replaced by new ones.



This expansion joint on the south approach bridge is maximally contracted and has collided a bit.



The side pedestrian walkways are narrow.

Kien Bridge seen from the river



Kien Bridge. $85+200+85=370\text{m}$



Large trucks pass on the deck.



Trucks on the deck.



Concrete box girder and the north tower.



PC concrete box girder. The box girder is constructed from segments.



The center of the span. Cable anchor structures are visible.



Slight concrete spalling is found on the web.




The side span box girders have been painted. The reason is unknown.

Appendix A7 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

7.1 Pamphlet Conservation of Mangrove Trees

SỰ QUAN TRỌNG CỦA VIỆC BẢO TỒN RỪNG NGẬP MẶN

Rừng ngập mặn là gì?:
 Rừng ngập mặn là một nhóm các cây và cây bụi sống trong khu vực bãi thụt triều ven biển.
 Tại Việt Nam, các khu rừng ngập mặn tập trung ở khu vực ven biển phía Bắc và phía Nam.



Tình trạng rừng ngập mặn ở Việt Nam:
 Sự thay đổi tổng diện tích rừng ngập mặn
 400,000 ha (1943) → 279,000ha (2006)
Giảm khoảng 30% trong 60 năm
<http://www.sgpp.org.vn/moitruongdothi/2007/11/133111/>

Lý do chính gây suy giảm diện tích rừng ngập mặn:

- Làm ao nuôi tôm và đất nông nghiệp
- Dự án đầu tư công (Phát triển đường xá, bến cảng,...)
- Xây dựng nhà cửa, khách sạn,...
- Khai thác gỗ làm củi
- Chất độc làm rụng lá sử dụng trong thời kỳ

Bảo tồn rừng ngập mặn:
 Ngăn chặn sự suy giảm diện tích đồng thời tái sinh rừng ngập mặn rất quan trọng để bảo vệ và đảm bảo lợi ích sinh thái cho các xã ven biển.

Lợi ích của rừng ngập mặn:


Lợi ích bảo vệ

- Bảo vệ bờ sông và bờ biển
- Giảm thiệt hại phi vật chất do thiên tai gây ra (tổn thương, tử vong)
- Giảm gián tiếp thiệt hại do thiên tai gây ra (dài hạn) (giảm năng suất hoặc các tổn thương do xâm nhập mặn)
- Ổn định bờ biển (giảm xói mòn đất)
- Giảm chi phí bảo trì và sửa chữa đê biển
- Giảm thiệt hại vật chất do thiên tai gây ra (Cơ sở vật chất công cộng, các tòa nhà, cây trồng, vật nuôi, nuôi trồng thủy sản)



Lợi ích sinh thái

- Hấp thụ Các bon
- Duy trì dinh dưỡng
- Giữ các loại trầm tích
- Giữ môi trường đa dạng sinh học
- Giảm ảnh hưởng của lụt lội
- Xử lý nước thải
- Cung cấp và bổ sung nước

Liên hợp rừng ngập mặn:
 Du lịch sinh thái có thể tạo ra sự thúc đẩy về kinh tế và chính sách để quản lý và bảo tồn và có thể mang lại lợi ích cho cộng đồng địa phương và nền kinh tế của khu vực.



Khu vực thăm quan

Đường đi bộ

Figure 7.1-1 Pamphlet Conservation of Mangrove Trees

7.2 Monitoring Form

1. Responses/actions to comments and guidance from government authorities and the public

Monitoring item	Monitoring results during report period

2. Mitigation measures

- Air quality (ambient air quality)

Frequency: once in 3 months

Item	Unit	Measured value (mean)	Measured value (max.)	QCVN 05:2013/BTNMT		Remarks (measured at 6 sites)
				1 hr-average	24 hr-average	
SO ₂	µg/m ³			350	125	During 16 hrs (1 hr/time)
CO	µg/m ³			30,000	-	During 16 hrs (1 hr/time)
NO ₂	µg/m ³			200	100	During 16 hrs (1 hr/time)
TSP	µg/m ³			300	200	During 16 hrs (1 hr/time)
PM ₁₀	µg/m ³			-	150	During 16 hrs (1 hr/time)
PM _{2.5}	µg/m ³			-	50	During 16 hrs (1 hr/time)
Microclimate	-		-	-	-	-

- Water quality (surface water quality), water usage

Frequency: once in 3 months

Item	Unit	Measured value (Mean)	Measured value (Max.)	QCVN 08:2008/ BTNMT		Remarks (measured at 9 points)
				B1	B2	
Low Tide						
pH				5, 5-9	5, 5-9	
DO	mg/l			≥4	≥2	
TSS	mg/l			50	100	
COD	mg/l			30	50	
BOD ₅	mg/l			15	25	
NH ₄ ⁺	mg/l			0.5	1	
Cl ⁻	mg/l			600	-	
F ⁻	mg/l			1.5	2	
NO ₂ ⁻	mg/l			0.04	0.05	
NO ₃ ⁻	mg/l			10	15	
PO ₄ ³⁻	mg/l			0.3	0.5	
CN ⁻	mg/l			0.02	0.02	
As	mg/l			0.05	0.1	
Cd	mg/l			0.01	0.01	
Pb	mg/l			0.05	0.05	
Hg	mg/l			0.001	0.002	
Oil & grease	mg/l			0.1	0.3	
Phenol (total)	mg/l			0.01	0.02	
E-coli	mpn/100ml			100	200	
Coliform	mpn/100ml			7500	10000	

Low Tide						
pH				5, 5-9	5, 5-9	
DO	mg/l			≥4	≥2	
TSS	mg/l			50	100	
COD	mg/l			30	50	
BOD ₅	mg/l			15	25	
NH ₄ ⁺	mg/l			0.5	1	
Cl ⁻	mg/l			600	-	
F ⁻	mg/l			1.5	2	
NO ₂ ⁻	mg/l			0.04	0.05	
NO ₃ ⁻	mg/l			10	15	
PO ₄ ³⁻	mg/l			0.3	0.5	
CN ⁻	mg/l			0.02	0.02	
As	mg/l			0.05	0.1	
Cd	mg/l			0.01	0.01	
Pb	mg/l			0.05	0.05	
Hg	mg/l			0.001	0.002	
Oil & grease	mg/l			0.1	0.3	
Phenol (total)	mg/l			0.01	0.02	
E-coli	mpn/100ml			100	200	
Coliform	mpn/100ml			7500	10000	

- Construction waste

Frequency: once in 1 months

Monitoring item	Monitoring results during report period
Volume of waste generated	
Storage, collection, transportation, disposal	
Conditions of dumping sites	

- Domestic solid waste

Frequency: once in 1 months

Monitoring item	Monitoring results during report period
Volume of waste generated	
Storage	
Collection, transportation, disposal	

- Hazardous waste

Frequency: once in 1 months

Monitoring item	Monitoring results during report period
Volume of waste generated	
Storage	
Collection, transportation, disposal	

- Wastewater

Frequency: once in 1 months

Monitoring item	Monitoring results during report period
Domestic wastewater : water quality (BOD ₅ , total coliform, TSS), generated volume, collection, disposal	
Construction wastewater: generated volume, collection, treatment, disposal	

- Noise (Leq)

Frequency: once in 3 months

Item	Unit	Measured value		QCVN 26:2010/BTNMT (in a common area)		Remarks (measured at 6 sites)
		Day-time	Night-time	Day-time	Night-time	
Noise	dB(A)			70	55	During 16 hrs (continuously)

- Vibration (Laeq)

Frequency: once in 3 months

Item	Unit	Measured value		QCVN 27:2010/BTNMT (in a common area)		Remarks (measured at 6 sites)
		Day-time	Night-time	Day-time	Night-time	
Vibration	dB			75	Based level	During 16 hrs (continuously)

- Bottom sediment – (river beds)

Frequency: once in 3 months

Item	Unit	Measured value	QCVN 43/2012/BTNMT	Remarks (measured at 5 points)
As	mg/kg			
Cd	mg/kg			
Pb	mg/kg			
Zn	mg/kg			
Hg	mg/kg			
Cr	mg/kg			
Total HC	mg/kg			

3. Natural environment

- Ecosystem

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
Mangrove forests and wetlands along Cam River, Ruot Lon River	

- Hydrological conditions

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
Hydrological conditions of Cam River, Ruot Lon River, and other canals in Thuy Nguyen District	

- Existing social infrastructure and service

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
Relocation sites of electric cables, communication cables, water supply pipes, irrigation ditches, drainage gutters, etc.	

- Social capital, local organizations, children's rights

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
Sites planned for pedestrian crossings	

- Landscape

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
Trees along Nguyen Trai Street, and all existing vegetation along the bridge approach roads and RR3	

- Working environment

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
All construction sites and worker camps	

- Accidents, transboundary impacts, global warming

Frequency: once in 3 months

Monitoring item	Monitoring results during report period
All construction sites and along the roads used to transport materials and wastes	

7.3 Environmental Check List

1. Nguyen Trai Bridge

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) (b) (c) The EIA is under preparation, and it has not been submitted and approved yet. (d) N/A
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) The stakeholder meeting was held two times. The first meeting was held in May, 2015 and explained about the overview of the project. The second meeting was held in December, 2015, giving explanation on the environmental impact assessment, the status of the site, environmental impact mitigation measures, and ect. (b) Comments are reflected to the environmental management plan.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) The alternatives were discussed regarding zero-option, site selection, cost, and natural and social environment.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken?(b) If air quality already exceed country's standards near the route, is there a possibility that the project will make air pollution worse?	(a) Y (b) Y	(a) Yes. Vehicle traffic flow on Nguyen Trai Bridge may affect ambient air quality of the area. At the southern site of the planned Nguyen Trai Bridge, concentrations of PM10 in ambient air are predicted excess the allowable limits stipulated in Vietnam standard (QCVN 05: 2013 and QCVN 06:2009). Measures to minimize generation of PM10, such as regular maintenance of road and bridge pavement, regular spraying water on road surface, etc. should be carried out. (b) Air quality in term of PM10 has already exceeded Vietnamese standards at the location on the southern side of the planned Nguyen Trai Bridge. The project may help reduce traffic congestion on the existing road networks, and thus reduce air pollution in the city. However, in order to conserve the ambient air quality of the city, it is recommended that Hai Phong City shall make efforts to push forward the implementation of the comprehensive plans (such as the Green Growth Promotion Plan of the City of Hai Phong), including the improvement of mass transit public transportation infrastructure such as bus, railway, etc.
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? (b) Is there a possibility that the project will contaminate water sources, such as well water?	(a) Y (b) N	(a) Yes. Dust, rubbish, oil, etc. from the bridge surface runoff may cause water quality degradation in downstream water areas. However, this impact may be mitigated by the proper management of bridge surface, etc. (b) No. The project is expected not cause contamination of water sources, such as well water.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle traffic comply with the country's standards? (b) Do low frequency sound from the vehicle traffic comply with the country's standards?	(a) Y (b) Y	(a) (b) At both sides of Nguyen Trai Bridge, the noise levels are predicted lower than the allowable limits stipulated in Vietnam standard (QCVN 26:2010, 70dBA in daytime). Vibrations are predicted within the allowable limit set by Vietnam standard.
3 Natural Environment	(1) Protected Areas	a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) No. There is no any protected area designated by Vietnam's laws or international treaties and conventions around the project area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) Is there a possibility that installation of bridges and access roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	(a) N (b) N (c) N (d) N (e) Y	(a) No, the project site does not encompass primeval forests, tropical rain forests, ecologically valuable habitats, etc. (b) No, the project site does not encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions. (c) Significant ecological impacts are not anticipated. (d) Impacts such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock, etc. are not expected. (e) An area of about 1,800m ² of mangrove forest under the viaduct on the northern side of Nguyen Trai Bridge would be acquired to make land for construction of the bridge. Therefore, the reforestation of about 1,800m ² of mangrove forest should be carried out as compensation to the lost mangrove forest. Significant disturbance of ecosystems due to introduction of exotic species and pests is not expected.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the installation of structures will adversely affect surface water and groundwater flows?	(a) Y	(a) The flow of Cam River may be obstructed partly by the foundations of Nguyen Trai Bridge. However, the impact is assessed negligible since the areas occupied by these bridge foundations are relatively small comparing to the width of the river.
	(4) Topography and Geology	(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?(b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?	(a) N (b) N (c) Y	(a) (b) Nguyen Trai Bridge is planned on the flat terrain, therefore slope failures or landslides are not expected. (c) A short part of the approach road on the northern side of Nguyen Trai Bridge will be embanked. However, the soil runoff from the road embankments is predicted insignificantly with proper soil erosion prevent measures.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y (j) Y	(a) Efforts for avoidance and minimization of the resettlement impacts were discussed during the preparatory survey and will continuously be considered in the following project phases. (b) Stakeholder meetings and focus group meetings were held during the preparatory survey and will continuously be organized such kinds of public participation opportunities in the following project phases. (c) Done during the preparatory survey. (d) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines. (e) It has been prepared in the resettlement action plan (RAP). (f) Particular attentions are paid in the RAP. (g) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines. (h) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines. (i) Monitoring schemes for resettlement implementation were developed in the RAP. (j) It has been prepared in the resettlement action plan (RAP) and will be established during the implementation phases.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Living and Livelihood	<p>(a) Where bridges and access roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?</p> <p>(e) Is there any possibility that project will impede the movement of inhabitants?</p> <p>(f) Is there any possibility that bridges will cause a sun shading and radio interference?</p>	<p>(a) N (b) N (c) N (d) N (e) Y (f) Y</p>	<p>(a) Means of transportation, land use, sources of livelihood may not be affected negatively so much by the project.</p> <p>(b) No significant possibility is expected.</p> <p>(c) No significant possibility is expected.</p> <p>(d) No significant possibility is expected.</p> <p>(e) New alignment for the ring road No.3 may cause some degrees of hindrance for road crossing to opposite areas.</p> <p>(f) Approach road for the bridges will cause negative impact on sun shading.</p>
	(3) Heritage	<p>(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?</p>	(a)	<p>(a) There is no any archeological, historical, cultural and religious heritage observed existing along the project route.</p>
	(4) Landscape	<p>(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?</p>	(a)	<p>(a) There is no outstanding scenic landscape observed along the project route.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) - (b) -	(a) Almost all the target population is ethnic majority of Kinh (b) Almost all the target population is ethnic majority of Kinh
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (b) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (c) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (d) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards.
5 others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Measures to reduce impacts of noise, vibration, turbid water, dust, wastes, etc. during construction phase are proposed in the environmental management plan (EMP) . (b) Measures to reduce adverse impacts to natural environment including ecosystem during construction phase are proposed in the environmental management plan (EMP). (c) Necessary measures should be taken based on the monitoring and any other documents including EMP, EIA, RAP, etc.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) - (c) Y (d) N	(a) Yes. A monitoring plan (EMoP) for potential impacts is developed and described in the EIA Report. (b) Details on the items, methods and frequencies of the monitoring plan are described in the EIA Report. (c) The monitoring framework is proposed and described in the EIA Report. However, it should be confirmed and followed up during the next stages of the project. (d) In Vietnam, there is no regulatory requirements for regular monitoring report. However, if the project is implemented with cooperation from JICA, the project proponent will be obligated to submit the monitoring reports to JICA and Hai Phong City DONRE on a quarterly basis.
Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways and Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation). (b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(a) - (b) -	(a)N/A (b)N/A
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) -	(a)N/A

- 1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

2. Vu Yen Bridge

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) (b) (c) (d) The EIA is under preparation, and it has not been submitted and approved yet.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) The stakeholder meeting was held two times. The first meeting was held in May, 2015 and explained about the overview of the project. The second meeting was held in December, 2015, giving explanation on the environmental impact assessment, the status of the site, environmental impact mitigation measures, and ect. (b) Comments are reflected to the environmental management plan.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) The alternatives were discussed regarding zero-option, site selection, cost, and natural and social environment.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(1) Air Quality	(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken? (b) If air quality already exceed country's standards near the route, is there a possibility that the project will make air pollution worse?	(a) Y (b) Y	(a) Yes. Vehicle traffic flow on Vu Yen Bridge may affect ambient air quality of the area. At the southern site of the planned Vu Yen Bridge, concentrations of PM10 and TSP (total suspended particulates) in ambient air are predicted exceed the allowable limits stipulated in Vietnam standard (QCVN 05: 2013 and QCVN 06:2009). Measures to minimize generation of PM10 and TSP, such as regular maintenance of road and bridge pavement, regular spraying water on road surface, etc. should be carried out. (b) Air quality has already exceeded Vietnamese standards at the location on the southern side of the planned Vu Yen Bridge, at the intersection with Provincial Road No. 356. The project may help reduce traffic congestion on this provincial road, and thus contribute to the reduction of air pollution in the city. However, in order to conserve the ambient air quality of the city, it is recommended that Hai Phong City shall make efforts to push forward the implementation of the comprehensive plans (such as the Green Growth Promotion Plan of the City of Hai Phong), including the improvement of mass transit public transportation infrastructure such as bus, railway, etc.
	(2) Water Quality	(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? (b) Is there a possibility that the project will contaminate water sources, such as well water?	(a) Y (b) N	(a) Yes. Dust, rubbish, oil, etc. from the bridge surface runoff may cause water quality degradation in downstream water areas. However, this impact may be mitigated by the proper management of bridge surface, etc. (b) No, in the operation phase, the project is expected not cause contamination of water sources, such as well water.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(4) Noise and Vibration	(a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards? (b) Do low frequency sound from the vehicle and train traffic comply with the country's standards?	(a) Y (b) N	(a) (b) At the southern site of Vu Yen Bridge, the noise level is predicted excess the allowable limits stipulated in Vietnam standard (QCVN 26:2010, 70dBA in daytime). Vibrations are predicted within the allowable limit set by Vietnam standard.
3 Natural Environment	(1) Protected Areas	a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) No. There is no any protected area designated by Vietnam's laws or international treaties and conventions around the project area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) Is there a possibility that installation of bridges and access roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (non-native invasive) species and pests? Are adequate measures for preventing such impacts considered?	(a) N (b) N (c) N (d) N (e) N	(a) No, the project site does not encompass primeval forests, tropical rain forests, ecologically valuable habitats, etc. (b) No, the project site does not encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions. (c) Significant ecological impacts are not anticipated. (d) Impacts such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock, etc. are not expected. (e) An area of about 1,800m ² of mangrove forest under the viaduct on the northern side of Vu Yen Bridge would be acquired to make land for construction of the bridge. Therefore, the reforestation of about 1,800m ² of mangrove forest should be carried out as compensation to the lost mangrove forest. Significant disturbance of ecosystems due to introduction of exotic species and pests is not expected.
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the installation of structures will adversely affect surface water and groundwater flows?	(a) Y	(a) The flow of Cam River may be obstructed partly by the foundations of Vu Yen Bridge. However, the impact is assessed negligible since the areas occupied by these bridge foundations are relatively small comparing to the width of the

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				river.
	(4) Topography and Geology	<p>(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?</p> <p>(b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?</p> <p>(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?</p>	<p>(a) N (b) N (c) Y</p>	<p>(a) (b) Vu Yen Bridge is planned on the flat terrain, therefore slope failures or landslides are not expected.</p> <p>(c) A short part of the approach road on the northern side of Vu Yen Bridge will be embanked. However, the soil runoff from the road embankments is predicted insignificantly with proper soil erosion prevent measures.</p>
4 Social Environ ment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Are the compensations going to be paid prior to the resettlement?</p> <p>(e) Are the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and</p>	<p>(a) Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y (j) Y</p>	<p>(a) Efforts for avoidance and minimization of the resettlement impacts were discussed during the preparatory survey and will continuously be considered in the following project phases.</p> <p>(b) Stakeholder meetings and focus group meetings were held during the preparatory survey and will continuously be organized such kinds of public participation opportunities in the following project phases.</p> <p>(c) Done during the preparatory survey.</p> <p>(d) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines.</p> <p>(e) It has been prepared in the resettlement action plan (RAP).</p> <p>(f) Particular attentions are paid in the RAP.</p> <p>(g) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines.</p> <p>(h) It will be secured based on both Vietnamese domestic legal regulations and the JICA's</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?		Environmental and Social Guidelines. (i) Monitoring schemes for resettlement implementation were developed in the RAP (j) It has been prepared in the resettlement action plan (RAP) and will be established during the implementation phases.
	(2) Living and Livelihood	(a) Where bridges and access roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts? (b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary? (c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and	(a) N (b) N (c) N (d) N (e) Y (f) Y	(a) Means of transportation, land use, sources of livelihood may not be affected negatively so much by the project. (b) No significant possibility is expected. (c) No significant possibility is expected. (d) No significant possibility is expected. (e) New alignment for the ring road No.3 may cause some degrees of hindrance for road crossing to opposite areas. (f) Approach road for the bridges will cause negative impact on sun shading.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		traffic accidents)? (e) Is there any possibility that project will impede the movement of inhabitants? (f) Is there any possibility that bridges will cause a sun shading and radio interference?		
	(3) Heritage	a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no any archeological, historical, cultural and religious heritage observed existing along the project route.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is no outstanding scenic landscape observed along the project route.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) - (b) -	(a) Almost all the target population is ethnic majority of Kinh (b) Almost all the target population is ethnic majority of Kinh
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for	(a) Y (b) Y (c) Y (d) Y	(a) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (b) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (c) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?		(d) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards.
5 others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Measures to reduce impacts of noise, vibration, turbid water, dust, wastes, etc. during construction phase are proposed in the environmental management plan (EMP). (b) Measures to reduce adverse impacts to natural environment including ecosystem during construction phase are proposed in the environmental management plan (EMP). (c) Necessary measures should be taken based on the monitoring and any other documents including EMP, EIA, RAP, etc.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) - (c) Y (d) N	(a) Yes. A monitoring plan (EMoP) for potential impacts is developed and described in the EIA Report. (b) Details on the items, methods and frequencies of the monitoring plan are described in the EIA Report. (c) The monitoring framework is proposed and described in the EIA Report. However, it should be confirmed and followed up during the next stages of the project. (d) In Vietnam, there is no regulatory requirements for regular monitoring report. However, if the project is implemented with cooperation from JICA, the project proponent will be obligated to submit the monitoring reports to JICA and Hai Phong City

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
				DONRE on a quarterly basis.
Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Roads, Railways and Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation). (b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).	(a) - (b) -	(a)N/A (b)N/A
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) -	(a)N/A

- 1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, ppriaria environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

3. Ring Road 3

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) (b) (c) (d) The EIA is under preparation, and it has not been submitted and approved yet.
	(2) Explanation to the Local Stakeholders	a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) The stakeholder meeting was held two times. The first meeting was held in May, 2015 and explained about the overview of the project. The second meeting was held in December, 2015, giving explanation on the environmental impact assessment, the status of the site, environmental impact mitigation measures, and ect. (b) Comments are reflected to the environmental management plan.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) The alternatives were discussed regarding zero-option, site selection, cost, and natural and social environment.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
2 Pollution Control	(1) Air Quality	<p>(a) Is there a possibility that air pollutants emitted from the project related sources, such as vehicles traffic will affect ambient air quality? Does ambient air quality comply with the country's air quality standards? Are any mitigating measures taken?</p> <p>(b) Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse?</p>	<p>(a) Y (b) Y</p>	<p>(a) Yes. Vehicle traffic flow on Ring Road No.3 may affect ambient air quality of the area. At the intersections between the planned road with National Highway No.10, Provincial Road No.359, and the rural road (km9+500), - concentrations of TSP (total suspended particulates) in ambient air are predicted exceed the allowable limits stipulated in Vietnam standard (QCVN 05: 2013). Measures to minimize generation of TSP, such as regular maintenance of road and bridge pavement, regular spraying water on road surface, etc. should be carried out.</p> <p>(b) Air quality in term of PM10 and TSP concentrations has already exceeded Vietnamese standards at the intersection between the planned Ring Road No.3 with Provincial Road No. 359. The project may help reduce traffic congestion on this provincial road, and thus contribute to the reduction of air pollution in the city. However, in order to conserve the ambient air quality of the city, it is recommended that Hai Phong City shall make efforts to push forward the implementation of the comprehensive plans (such as the Green Growth Promotion Plan of the City of Hai Phong), including the improvement of mass transit public transportation infrastructure such as bus, railway, etc.</p>
	(2) Water Quality	<p>(a) Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas?</p> <p>(b) Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater?</p> <p>(c) Do effluents from various facilities, such as parking</p>	<p>(a) Y (b) N (c) N</p>	<p>(a) Yes, there is a possibility that soil runoff from the embankments of RR No.3, dust, rubbish, oil, etc. from the road/bridge surface runoff, etc. may cause water quality degradation in downstream water areas. However, this impact may be mitigated by the proper management of road embankments, road/bridge surface, etc.</p> <p>(b) No, in the operation phase, the project is expected not cause</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas not to comply with the country's ambient water quality standards?		contamination of water sources, such as well water. (c) The project facilities such as parking areas/service areas are not planned in the project.
	(3) Wastes	(a) Are wastes generated from the project facilities, such as parking areas/service areas, properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) Works to regularly collect wastes and clean dust on the road surface are described in the EMP.
	(4) Noise and Vibration	a) Do noise and vibrations from the vehicle and train traffic comply with the country's standards?	(a) N	(a) At the intersections between the planned RR3 and National Highway No.10, Provincial Road No. 356, and a rural road (km 9+500), - the noise levels are predicted slightly excess the allowable limits stipulated in Vietnam standard (QCVN 26:2010, 70dBA in daytime). Vibrations are predicted within the allowable limit set by Vietnam standard.
3 Natural Environment	(1) Protected Areas	a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) No. There is not any protected area designated by Vietnam's laws or international treaties and conventions around the project area.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Are adequate protection measures taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? (e) Is there a possibility that	(a) N (b) N (c) N (d) N (e) Y (f) Y	(a) No, the project site does not encompass primeval forests, tropical rain forests, ecologically valuable habitats, etc. (b) No, the project site does not encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions. (c) Significant ecological impacts are not anticipated. (d) Impacts such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock, etc. are not expected. (e) (f) An area of about 13,800m ² of mangrove forest on the banks of Ruot Lon River under the viaducts of the planned Ruot Lon Bridge would

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
		<p>installation of roads will cause impacts, such as destruction of forest, poaching, desertification, reduction in wetland areas, and disturbance of ecosystems due to introduction of exotic (nonnative invasive) species and pests? Are adequate measures for preventing such impacts considered?</p> <p>(f) In cases the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of natural environments?</p>		<p>be acquired to make land for construction of the bridge. Therefore, the reforestation of about 13,800m² of mangrove forest should be carried out as compensation to the lost mangrove forest. Significant disturbance of ecosystems due to introduction of exotic species and pests is not expected.</p>
	(3) Hydrology	<p>a) Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surfacewater and groundwater flows?</p>	(a) N	<p>(a) The foundations of Ruot Lon Bridge are planned on land, therefore the flow of Ruot Lon River may not be obstructed by these foundations.</p>
	(4) Topography and Geology	<p>(a) Is there any soft ground on the route that may cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides, where needed?</p> <p>(b) Is there a possibility that civil works, such as cutting and filling will cause slope failures or landslides? Are adequate measures considered to prevent slope failures or landslides?</p> <p>(c) Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measures taken to prevent soil runoff?</p>	<p>(a) N (b) N (c) Y</p>	<p>(a) (b) Ring Road 3 is planned on the flat plain area, therefore slope failures or landslides are not expected.</p> <p>(c) A desirable part of RR3 will be embanked. Measures to reduce the soil erosion from the road embankments are proposed in the environmental management plan (EMP).</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Are the compensations going to be paid prior to the resettlement? (e) Are the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) Y (h) Y (i) Y (j) Y	(a) Efforts for avoidance and minimization of the resettlement impacts were discussed during the preparatory survey and will continuously be considered in the following project phases. (b) Stakeholder meetings and focus group meetings were held during the preparatory survey and will continuously be organized such kinds of public participation opportunities in the following project phases. (c) Done during the preparatory survey (d) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines. (e) It has been prepared in the resettlement action plan (RAP) (f) Particular attentions are paid in the RAP (g) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines. (h) It will be secured based on both Vietnamese domestic legal regulations and the JICA's Environmental and Social Guidelines. (i) Monitoring schemes for resettlement implementation were developed in the RAP (j) It has been prepared in the resettlement action plan (RAP) and will be established during the implementation phases.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Living and Livelihood	<p>(a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?</p> <p>(e) Is there any possibility that roads will impede the movement of inhabitants?</p> <p>(f) Is there any possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?</p>	<p>(a) N (b) N (c) N (d) N (e) Y (f) Y</p>	<p>(a) Means of transportation, land use, sources of livelihood may not be affected negatively so much by the project.</p> <p>(b) No significant possibility is expected.</p> <p>(c) No significant possibility is expected.</p> <p>(d) No significant possibility is expected.</p> <p>(e) New alignment for the ring road No.3 may cause some degrees of hindrance for road crossing to opposite areas.</p> <p>(f) Approach road for the bridges will cause negative impact on sun shading.</p>
	(3) Heritage	<p>a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?</p>	<p>(a) N</p>	<p>(a) There is no any archeological, historical, cultural and religious heritage observed existing along the project route.</p>
	(4) Landscape	<p>(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?</p>	<p>(a) N</p>	<p>(a) There is no outstanding scenic landscape observed along the project route.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?	(a) - (b) -	(a) Almost all the target population is ethnic majority of Kinh (b) Almost all the target population is ethnic majority of Kinh
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the projectproponent should observe in the project?(b) Are tangible safety considerations in place for individuals involved inthe project, such as the installation of safety equipment which preventsindustrial accidents, and management of hazardous materials?(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?(d) Are appropriate measures being taken to ensure that security guardsinvolved in the project not to viorate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (b) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (c) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards. (d) Working conditions during the construction phase shall be comply with both domestic legal framework and international standards.
5 others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Measures to reduce impacts of noise, vibration, turbid water, dust, wastes, etc. during construction phase are proposed in the environmental management plan (EMP) . (b) Measures to reduce adverse impacts to natural environment including ecosystem during construction phase are proposed in the environmental management plan (EMP). (c) Necessary measures should be taken based on the monitoring and any other documents including EMP, EIA, RAP, etc.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y (b) Y (c) Y (d) N</p>	<p>(a) Yes. A monitoring plan (EMoP) for potential impacts is developed and described in the EIA Report.</p> <p>(b) Details on the items, methods and frequencies of the monitoring plan are described in the EIA Report.</p> <p>(c) The monitoring framework is proposed and described in the EIA Report. However, it should be confirmed and followed up during the next stages of the project.</p> <p>(d) In Vietnam, there is no regulatory requirements for regular monitoring report. However, if the project is implemented with cooperation from JICA, the project proponent will be obligated to submit the monitoring reports to JICA and Hai Phong City DONRE on a quarterly basis.</p>
Note	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Roads, Railways and Forestry Projects checklist should also be checked (e.g., projects including large areas of deforestation).</p> <p>(b) Where necessary, pertinent items described in the Power Transmission and Distribution Lines checklist should also be checked (e.g., projects including installation of power transmission lines and/or electric distribution facilities).</p>	<p>(a) - (b) -</p>	<p>(a)N/A (b)N/A</p>

- 1) Regarding the term “Country’s Standards” mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

APPENDIX A8 RESETTLEMENT ACTION PLAN (RAP)

A8.1 Replacement Cost Survey Report

ABBREVIATIONS

WB	:	World Bank
JICA	:	Japan International Cooperation Agency
ODA	:	Official Development Assistance
ADB	:	Asian Development Bank
HPPC	:	Hai Phong People's Committee
LUR	:	Land-use Right
MARD	:	Ministry of Agriculture and Rural Development
MOC	:	Ministry of Construction
MOF	:	Ministry of Finance
MONRE	:	Ministry of Natural Resources and Environment
CPC	:	Commune People's Committee
DARD	:	Department of Agriculture and Rural Development
DOF	:	Department of Finance
DOC	:	Department of Construction
DONRE	:	Department of natural Resources and Environment
TEDI	:	Transport Engineering Design Inc.
RCS	:	Replacement Cost Study
APs	:	Affected Persons
LUR	:	Land-use Right
RAP	:	Resettlement Action Plan
EIA	:	Environmental Impact Assessment
NH	:	National highway
PR	:	Province road
QĐ2680	:	Decision No. 2680/2014/QĐ-UBND dated 03 December 2014 made by HPPC promulgating the regulation on compensation, assistance and resettlement when the State recovers land in the Haiphong city
QĐ58	:	Decision No. 58/2015/QĐ-UBND dated 01 December 2015 by HPPC on promulgating price unit of plants and aquaculture, investment in land costs for aquaculture service compensation, support clearance when the state acquired land in the territory of the city of Haiphong
QĐ324	:	Decision No. 324/2015/QĐ-UBND dated 02 May 2015 by HPPC on promulgating price unit of structures for compensation and assistance when the state acquired land in the territory of Haiphong city
QĐ2970	:	Decision No. 2970/2014/QĐ-UBND dated 24 December 2013 by HPPC enacted regulations on land prices in Haiphong city in from 2015 to 2019

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I. INTRODUCTION

1.1. Project Implementation Background

Government of Vietnam established the Plan on Socio-Economic Development stage 2011 – 2015 with the aim is rapid and sustainable development. As this plan, Haiphong City is one of the priority subjects for development. Haiphong City, has the Lach Huyen International port, is one of growth poles of Northern Vietnam. Lach Huyen Port is proposed to be put into operation from 2017.

Base on “Adjustment of Construction General Planning of Haiphong City by 2025 and with a vision till 2050” that was approved in 2009, Haiphong City plan to develop the existing city area and new resident area and industrial complex on the North bank of Cam River. Due to the large-scale development, transportation demand and serious traffic jam is proposed to increase remarkable in near future. At present, there are 2 bridges over the Cam River, however, as forecast in the short time, these bridges could not be meet demand of transport. The resolution for transport problem must be complete the Ring Road and build the new constructions over the Cam River.

Japanese Ministry of Economy, Trade and Industry established the Pre-Feasibility Study Report of Haiphong Trunk Road Construction Project at Haiphong City, Vietnam (hereinafter is Project), and submitted this report to Haiphong City People Committee (hereinafter is Haiphong CPC) in February, 2014.

Haiphong CPC reviewed the Pre-Feasibility report of Project and consulted with the ODA fund management authorities in Vietnam to require support for preparation survey work to get a capital loan to implementation the Project from Japan International Cooperation Agency (JICA). Base on the meetings between JICA delegation and Haiphong CPC, JICA decide sending a Preparation Survey Team include of companies as Chodai Co.,Ltd, Oriental Consultants Global and Almec VPI Co.,Ltd that they implement the Project’s survey in Vietnam and toward to set up the ODA project. Survey work include of Design Study, Economic Analysis, Study on Maintenance Management Structure, Environmental Impact Assessment (EIA) and Resettlement Action Plan (RAP).

Survey Team began on March 2015 and intent to complete the survey in January 2016.

1.2. Scope and Scale of Haiphong Trunk Road Construction Project

Haiphong Trunk Road Construction Project is implemented by 3 Components that show on Figure 1. (1) Nguyen Trai Bridge; (2) Ring road no.3; (3) Vu Yen Bridge.

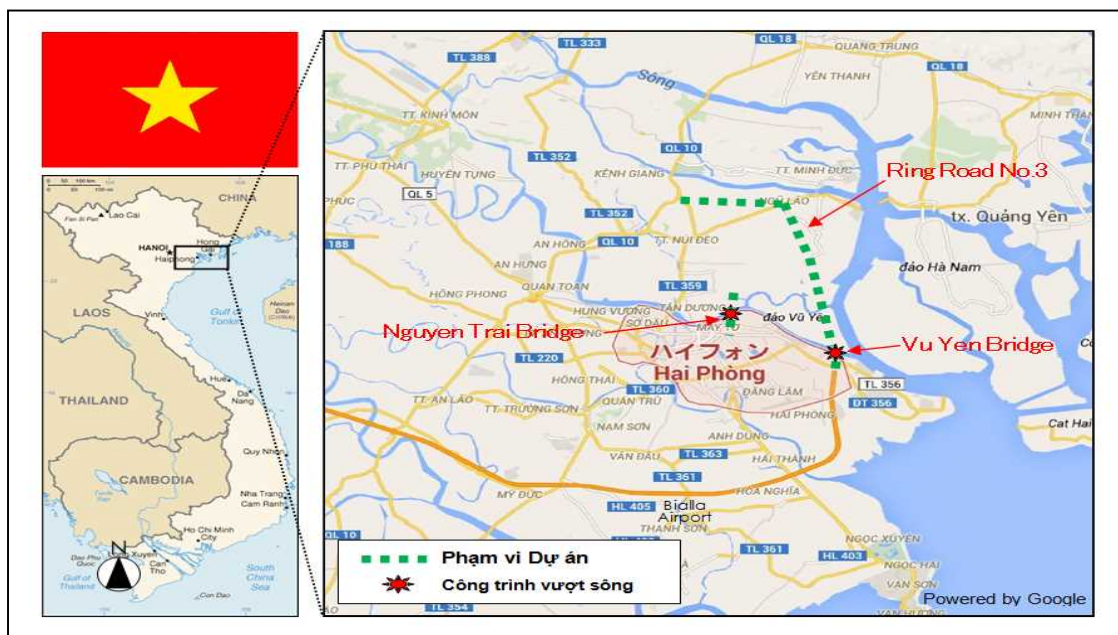


Figure 1: Project's Components Location

(1) **Nguyen Trai Bridge**

Nguyen Trai Bridge have total length is 2.0km include of length of bridge and approach roads. Starting point is the end of expanding Nguyen Trai road section (six corners belong to May To Ward, Ngo Quyen Urban District). Alignment same with Nguyen Trai existing Road, then cross Le Thanh Tong Street, go through the Hoang Dieu Port area, then over Cam River to the northern bank of Cam River about 500m, alignment continue the direction connect the main axis road of VSIP. Ending point connect to end point of main axis road of VSIP (belong to Duong Quan commune, Thuy Nguyen District). Detail in Figure 2.

Width of approach road subbase B = 50.5m

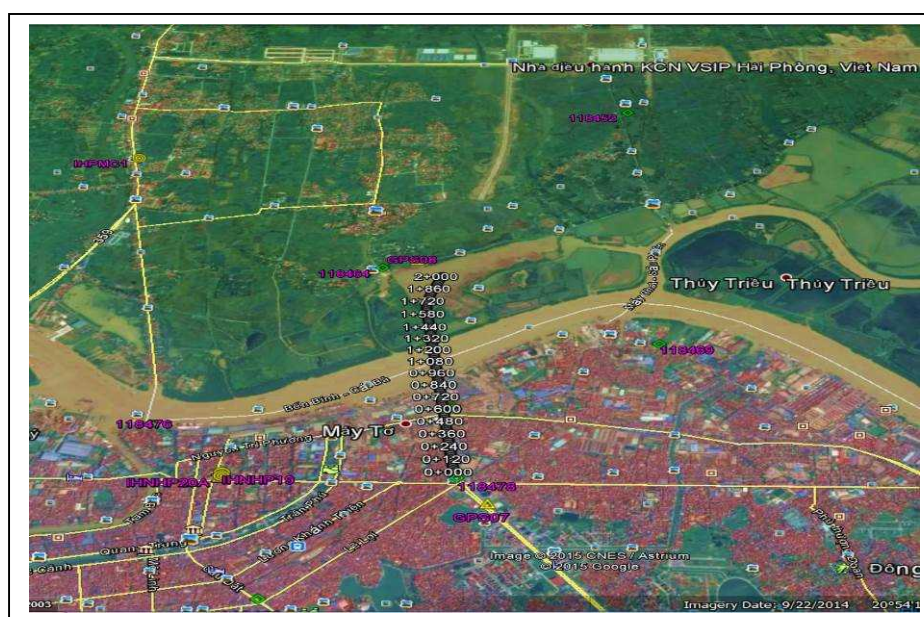


Figure 2: Nguyen Trai Bridge Location

(2) Ring Road No.3

Ring Road no.3 have total length is 13km, beginning point connect to NH10 at Kênh Giang T-junction. Alignment goes through communes as Hoa Binh, Kênh Giang, An Lu, Trung Ha, Thuy Trieu, Ngu Lao, Phuc Le, Pha Le, Lap Le. Ending point is at Km13+000 in Vu Yen Island. Detail in Figure 3.

Ring Road no.3 is designed with expressway scale include of 4 vehicle lanes, width of subbase is B = 68.0m.

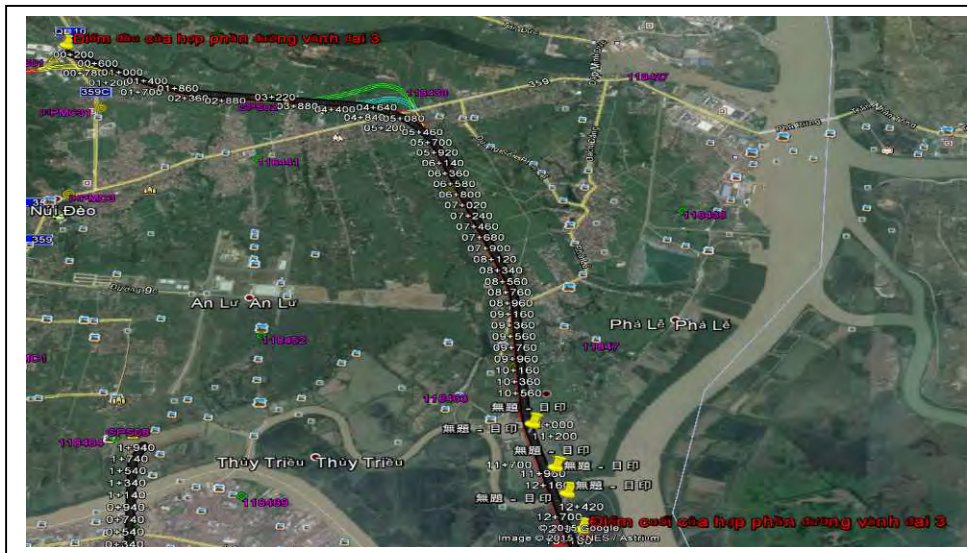


Figure 3: Ring Road no.3 Location

(3) Vu Yen Bride

Vu Yen Bridge have total length is 3.6km include of length of bridge and approach roads. Beginning point connects to the ending point of Ring Road no.3 (at station Km13+000) in Vu Yen Island. Alignment goes to northwest – southeast direction, to the left bank of Cam River, it passes over to the right bank of Cam River, then cross the Hai An port, and end at the aquaculture lagoon area at Dong Hai commune, Hai An district. Width of subbase approach roads B is 50.5m. Detail in Figure 4.



Figure 4: Vu Yen Bridge Location

1.3. Project Affected Objects

Project Affected Objects involve the types of appropriated land (annual crop land, perennial crop land – garden land, water surface land for fishing, homestead land, transport land) and types of fruit tree of households in Project affected area as jackfruit, mango, longan, star fruit, guava, dracontomelum, sapodilla, grape fruit, banana and rice... in which rice has the largest appropriated area.

1.4. Purposes of Replacement Cost Study

Haiphong Trunk Road Construction Project is implemented means permanent recovering land, crops, and farm produces; architectural objects and crops of people in the Clearance Scope of Project. According to the JICA requirement, a Replacement Cost Study must be implemented in the scope of establishing the Resettlement Action Plan of Project in order to ensure that Affected Households will be compensated with the replacement cost for all of assets as land, trees, crops, and assets and works on the revoked land in the Clearance Scope of Project.

This report will include of results of replacement cost studies at locals belong to Project, as Thuy Nguyen Rural District, Hai An and Ngo Quyen Urban District.

1.5. Scope of Implementation and Influence of the Project

Project is implemented with 3 components: Nguyen Trai Bridge, Ring Road no.3 and Vu Yen Bridge that involve to permanent revoked the land plot of Affected Households belong to 14 wards/communes of 3 Urban District/ Rural District in Haiphong City. However, Haiphong CPC issued the Announcement no. 41/TB-UBND dated on February 9th 2015 on recovered land announcement to compensation and clearance for implementation the Vu Yen Bridge Construction Investment Project according to the General Plan on Dinh Vu – Cat Hai Economical Zone at Thuy Trieu commune, Thuy Nguyen Rural District and Dong Hai 1 Ward, Hai An Urban District by Vingroup is Owner Project. Thus, in scope of Replacement Cost Study report (RCS report), the replacement cost for Vu Yen Island will not be studied. Therefore, the scope of RCS report will only involve to permanent revoked land of Affected Households belong to 13 Wards/ Communes, detail as follow:

- Nguyen Trai Bridge: May To ward – Ngo Quyen Urban District; and Duong Quan commune – Thuy Nguyen Rural District;
- Ring Road no.3: include of communes as Kenh Giang, Hoa Binh, An Lu, Trung Ha, Thuy Trieu, Ngu Lao, Phuc Le, Pha Le, Lap Le – Thuy Nguyen Rural District;
- Vu Yen Bridge: Dong Hai 2 ward and Nam Hai ward – Hai An Urban District.

II. TASKS OF REPLACEMENT COST STUDY

2.1. Aim of Replacement Cost Study (RCS)

The important aim of the RCS is to ensure that the compensation unit prices for land, houses and affected assets are at replacement cost. The calculation of the full replacement cost based on the

following factors: (i) the fair market price; (ii) transaction costs; (iii) the benefit generation interest; (iv) cost for changes and recovery; and (v) other appropriate payments, if any. This will be achieved through an empirical surveys of the market and/or such other factors as productive capacity, equivalent attributes, value of replacement asset, disadvantage of the APs, etc., Simultaneously the unit prices are to be evaluated and compared with unit price legislated by Haiphong CPC.

2.2. Objectives of Replacement Cost Study

- Determine land price at the same time with RCS's survey.
- Determine current prices of trees and crops at the same time with RCS's survey.
- Determine materials price and labor cost of constructing houses and architectural projects at the same time with RCS's survey.
- Decide options of replacement cost for land, assets, tree, and crops at the same time with RCS's survey.

III. LEGAL FRAMEWORK

We based on legal documents of the Government of Vietnam and ADBs requirements to carry out the Replacement Cost Study.

3.1. Concepts of Replacement Cost/Market Price of the Government of Vietnam, JICA and other organizations...

Replacement Cost: is amount of money or necessary items to replace assets in its current condition in the present market price covering transaction costs (WB – OP4.12 Involuntary Resettlement);

- Replacement Cost of Agricultural Land: is Market Price of land that has the same productivity or potentiality around the affected area, plus costs for preparing flat land that has equal or more productivity than affected land and costs for registration and transfer tax.
- Replacement Cost of Urban Land: is the Market Price of land that has the same area and using purpose, with equal or better infrastructure and services, the best is in the neighbouring areas of affected area, plus registration costs and transfer tax.
- Housing and Public Structure: is the Market Price of constructing or purchasing a new structure with the same area and equal or better quality than the affected one. Or it is the cost of repairing parts of the affected structure, plus labor cost and contractor charge with registration cost and transfer tax¹.

Market Price: "Market price of one property is the estimative price level will be dealt on the market at the time of valuation between a willing buyer and a willing seller in the objective and independent commercial transaction, in the normal commercial conditions" (TĐGVN 01)

3.2. Basis of Evaluation

Legal basis for setting up evaluation method and Compensation, Assistance and Resettlement Policy of the Project and Rights of the Affected Households are based on Law of Socialist Republic of Vietnam and related legal documents as follow:

¹ The price deduction or value of materials is not calculated, as well as deduction of replacement cost of value of benefits from project towards affected assets is not made. The replacement cost must be the highest in 2 prices: before project and after displacement

Documents of the Government and related Ministries

- The Price Law No. 11/2012/QH13, dated 20/6/2012 of the National Assembly;
- The Land Law 2013 No. 45/2013/QH13, dated 29/11/2013 of the National Assembly;
- Decree No. 38/2013/ND-CP dated 23.04.2013 stipulates that "The compensation, support and resettlement of programs and projects implemented under the provisions of existing laws and international treaties on ODA and preferential loans to which the Socialist Republic of Vietnam is a member, In case of differences between the provisions of domestic law with international treaties to which the application is of the provisions of international treaties " (Article 46, Section 1);
- Decree No. 89/2013/ND-CP dated 6/8/2013 of the Government detailing the implementation of some articles of the price Law on the price valuation;
- Decree No. 177/2013/ND-CP, dated 14/11/2013 of the Government detailing and guiding the implementation of some articles of the Price Law;
- Decree No. 104/2014/ND-CP, dated 14/11/2014 of the Government Regulation on land prices framework;
- Decree No. 43/2014/ND-CP, dated 15/5/2014 of the Government detailing a number of Articles of 2013 Land Law;
- Decree No. 44/2014/ND-CP, dated 15/5/2014 of the Government regulations on land prices;
- Decree No. 45/2014/ND-CP, dated 15/5/2014 of the Government providing the collection of land use levy;
- Decree No. 47/2014/ND-CP, dated 15/5/2014 of the Government on compensation, support and resettlement upon land recovery by the State;
- Circular No. 12/2012/TT-BXD dated December 28, 2012 of the Ministry of Construction issuing the National Technical Regulation on rules of classifications and grading of civil and industrial buildings and urban infrastructures;
- Circular No. 23/2014/TT-BTNMT dated 19 May 2014, providing for certificate of land use right, house ownership and other properties associated with the land;
- Circular No. 36/2014/TT-BTNMT dated June 30, 2014 of the Ministry of Natural Resources and Environment on land pricing method; compilation of and adjustment to land price lists; determination of specific land prices and consultancy on land pricing;
- Circular No. 37/2014/TT-BTNMT dated June 30, 2014, detailed regulations on compensation, support, and resettlement upon land expropriation by the state;
- Circular No. 158/2015 / TT-BTC dated October 27, 2014 of the Ministry of Finance promulgating Vietnam's valuation standard No. 01, 02, 03 and 04;
- Circular No. 28/2015/TT-BTC dated March 06, 2015 of the Ministry of Finance promulgating Vietnam's valuation standard No. 05 06 and 07;
- Circular 74/2015 / TT-BTC dated 05/15/2015 of the Ministry of Finance on the estimates instructions, use and settlement of funding implementation of compensation, support and resettlement when state recovers land.

Decisions of Haiphong Provincial People's Committee

- Decision No. 2680/2014/QD-UBND dated December 03, 2014 made by Haiphong People's Committee promulgating the regulation on compensation, assistance and resettlement when the State recovers land in the Haiphong city;
- Decision No 58/2015/QD-UBND dated December 01, 2015 by Haiphong People's Committee on promulgating price unit of plants and aquaculture, investment in land costs for aquaculture service compensation, support clearance when the state acquired land in the territory of the city of Haiphong;
- Decision No 324/2015/QD-UBND dated May 02, 2015 by Haiphong People's Committee on promulgating price unit of structures for compensation and assistance when the state acquired land in the territory of the city of Haiphong;
- Decision No. 2970/2014/QD-UBND dated December 24, 2013 by Haiphong People's Committee enacted regulations on land prices in Haiphong city in from 2015 to 2019.

3.3. Principles and methods of evaluation

3.3.1. Principles:

- Principle of highest and best
- Principle of supply and demand

3.3.2. Method

The RCS is carried out by means of the following methods:

- 1) Carry out discussions and in-depth interviews with concerned provincial/ district government offices involved in setting the legislated unit rates for compensating recovered land and improvements found assets such as houses and other structures, annual crops, and perennial plants, to gain better understanding of the methodology they used in deciding on the legislated rates.
- 2) Interview local (provincial, district and commune) officials and residents to find out the current market rates for land within in the Project area as per record of recent sale transactions or, in the absence of an active market, based on other empirical facts, such as productive and location attributes, and availability of replacement land.
- 3) Quantitative information collection method: use the set of structural questions as to gather information on a large scale of transaction of land and property on land as well as transport and construction in the area. Meet the business households and agricultural specialists including local ones to set up the current unit price for annual crops and perennial plants.
- 4) Method of collecting and reviewing legal documents that were promulgated including unit price set of various kinds of land and unit price for other assets (including support). Besides, some provinces have promulgated various kinds of unit price for building materials. In case the provinces promulgate unit price of building materials, it is also considered and combined with the study of unit price of building materials in the project area. Interview contractors and workers to determine labor cost at present in the project area.
- 5) Comparison method: two ways can be applied:
 - The first way: The collection of unit price sets if possible should be studied in 3 years to compare the adjustment of price according to regions or to kinds of assets of the provinces.

- The second way: in case there is land transaction that is carried out in the study area, legal basis and comparison method will be use according to the guidance of the documents that are cited include of direct comparison method combined with deduction method.

Direct comparison method:

- Decree No. 44/2014/ND-CP, dated 15/5/2004 of the Government regulations on land prices;
- Circular No. 36/2014/TT-BTNMT dated June 30, 2014 of the Ministry of Natural Resources and Environment on land pricing method; compilation of and adjustment to land price lists; determination of specific land prices and consultancy on land pricing.

The determination of land price according to the direct comparison method is carried out as follow:

a. Step 1: Survey and collect information:

- a1. Site survey is in order to collect information on the evaluated land plot.
- a2. Survey and collect information at least 3 land plots with the features alike with the evaluated land plot, these features as purpose land use, location, benefit capacity, infrastructural structure, social condition, land plot, land size, topography, legal characteristic, land use right (hereinafter is compared land plots). These compared land plots were transferred in the market, or win the LUR auction in duration under 2 years at the land evaluation. Content of information include:
 - Land price;
 - Purpose land use, location, land plot, land size, topography, infrastructural structure, and social condition, legal characteristic, land use right, transferred time, win the auction LUR time.
- a3. Information on price of compared land plots are collected from sources bellow:
 - The price of auction LUR;
 - Land market price in land database;
 - The price of successful transactions on real estate transactions;
 - The price of successful transactions on the market is supplied by assignor or assignee through the direct interview;
 - Successful transactions are transactions that the assignee has paid for the assignor under the agreement and received the right to use land.
- a4. During the survey, information collection on land price, it is necessary to priority chose the information on price of auction LUR, the price of successful transactions on real estate transactions, land market price in land database, information in the last recent time with the land evaluation and in the location of evaluated lands. In case of in the evaluated land plots that is not enough information on land price, it is necessary to collect information in surrounding area that their natural and socio-economic conditions, infrastructural structure, social infrastructure same with the evaluated land.

In the survey and information collection, land plots, which will be change of land use purpose as approved annual land use plan of District level and/ or is not enough condition to transfer as regulation of Law on land, are not surveyed.

b. Step 2: Comparison, analysis and adjustment price caused by different factors of compared land plots and evaluated land plot

b1. Analysis and comparison to confirm the same and different factors of compared land plots and the evaluated land plots

b2. Adjust land price caused by different factors of compared plots and evaluated land plots.

Base on the different factors of compared land plots and evaluated land plots to adjust price of compared land plots according to the absolute value or percentage (%).

Price adjustment of compared land plots will be implemented base on principle of choosing the evaluated land plots as accurate; then adjust as absolute value first and as percentage later. If factors of compared land plot are poorer than evaluated land plot, price of compared land plot will be adjusted increase (plus); if they are better than evaluated land plot, they will be adjusted decrease (minor).

c. Step 3: Estimation price of evaluated land plot

Estimation price of evaluated land plot is determined through the price adjustment of each compared land plot caused by different factors of compared land plots and evaluated land plots as the below format:

Estimation price of evaluated land plot base on each compared land plot	=	Value each compared land plot	±	Price adjustment caused by different factors between compared land plot and evaluated land plot
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In case of market price change duration from LUR transferred/ or win the auction LUR time of compared land plots till the time of land price is determined, price of compared land plot will be adjusted back the time of determined land price with fluctuation market price index issued by Department of Natural Resource and Environment. If this index is not issued yet, it will be calculated on the market land price information that is collected in moments or statistical data of authorities if any.

d. Step 4: Determine the price of evaluated land plot

Determine the price of evaluated land plot by getting average number of estimation price levels of evaluated land plot (in step 3); this price must be ensured the different level with the estimation price under 10%.

Deduction method:

Application of deduction method is carried as follow:

a. Step 1: Survey and information collection

a1. Field survey in order to collect information on land plots and assets on land (hereinafter is real estate) that these prices are evaluated.

a2. Survey and collect information of at least 3 real estates (hereinafter is compared estates) have similar characteristics with the evaluated estate, such as land-use purpose, location, profitability, infrastructure condition, social condition, land area, land size, topography, legal characteristic on

LUR... These real estate, hereinafter is compared estates, were transferred in the market, or won the auction LUR under 2 years till the evaluated land price time. Content of information collection include:

- Land price;
- Land-use purpose, location, land area, land size, topography, infrastructure condition, social condition, land area, land size, topography, legal characteristic on LUR, and other information affected to land price;
- Information on real estates on land.

a3. Information on price of compared land plots are collected from sources bellow:

- The price of auction LUR;
- Land market price in land database;
- The price of successful transactions on real estate transactions;
- The price of successful transactions on the market is supplied by assignor or assignee through the direct interview;
- Successful transactions are transactions that the assignee has paid for the assignor under the agreement and received the right to use land.

a4. During the survey, information collection on land price, it is necessary to priority chose the information on price of auction LUR, the price of successful transactions on real estate transactions, land market price in land database, information in the recent time with the land evaluation and in the location of evaluated lands. In case of in the evaluated land plots that is not enough information on land price, it is necessary to collect information in surrounding area that their natural and socio-economic conditions, infrastructural structure, social infrastructure same with the evaluated land.

In the survey and information collection, land plots, which will be change of land use purpose as approved annual land use plan of District level and/ or is not enough condition to transfer as regulation of Law on land, are not surveyed.

b. *Step 2: Determine current value of assets on land of compared real estate*

Current value of assets on land of compared real estate is determined by below format:

Current value of assets on land of compared real estate	=	New construction value at the evaluated time	-	Depreciation value
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In which:

- New construction value at the evaluated time: is calculated by replacement cost to construct the new estate with equivalent technical standard or cost to improve the estates on land. The new construction value includes the direct expenses, indirect expenses and a suitable interest rate for owner and other costs and taxes that owner must pay as regulations.

- Depreciation value of estate on land include both visible and invisible depreciation (including the depreciation on physical caused by damage little by little during operation; depreciation because on its function become unsuitable; or the changing on structure, and by the impact of outside factors).

Calculation method for new construction value and depreciation value of estate on land is implemented according to the current stipulation. In case stipulation or specific guiding on calculation method for new construction value and depreciation value are not available, calculation is based on actual information and database that are collected on the market.

c. Step 3: Estimation the land price of compared real estate

Value of land of compared real estate is implemented according to the below format:

Value of land of compared real estate	=	Value of compared real estate	-	Current value of assets on land of compared real estate
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Estimation land price of compared real estate is implemented according to below format:

Land price of compared real estate	=	Value of compared real estate
		Area of compared land plot

d. Step 4: Land price determination of evaluated real estate

Land price determination of evaluated real estate is implemented as step 2, 3 and 4 of direct comparison method mentioned above.

- 6) Analysis and processing the data collected from questionnaire to be able to compare with unit price promulgated by provinces/cities (by region – by kinds of affected assets – by location...) in order to calculate the exceed rate of price (or not) from that apply the suitable compensation price for affected fixed assets (land, structure, annual crops, perennial plant) to ensure the compensation is carried out according to the replacement cost.

3.3.3. Factors Affecting the Accuracy of the Replacement Cost Study Results in Project Area

- There are few real estate transaction on the market in Project area; and if any, in the local databases, each time people want to get the certification of government, people always take the lower price than actual price of real estate, even the price similar with the promulgated price
- The psychology of people participating in the study, especially the affected people who always have the tendency to increase the values of lost assets;
- Value of workday depends much on different factors. Help among families in building or other works is not calculated by people, so it is difficult to provide an accurate workday unit price;
- The construction works are usually hired labor exchange value for each m2 of housing community, at the way lump sum (the amount of labor and materials) for m2 building.

IV. REPLACEMENT COST SURVEY RESULTS

4.1. Main Stakeholders

The replacement Cost Survey (RCS) team of the Transport Engineering Design Inc. (TEDI) has conducted consultations and interviews with the responsible officials of the functional Department of Agriculture and Rural Development (DARD), Department of Finance (DOF), Department of Construction (DOC), Department of natural Resources and Environment (DONRE) of Haiphong City; Land Fund Development Centres of Thuy Nguyen Rural District, Hai An, Ngo Quyen Urban Districts; and local leaders and cadastral officials of the communes affected by Project. Besides, the team also conducted interviews with representatives of affected households; owners of the dealer/ business and building materials store, some non affected households, households got transaction land on the market... to determine the market price of land, trees, crops and architectural objects. The results of the consultations and interviews as follows:

Process on the compensation unit price establishment, relation Departments based on the regulations of the Government and guidelines of the Ministries as follows:

- Compensation, Assistance and Resettlement Board or Land Fund Development organization is responsible to prepare and submit (provincial and district) proposed compensation, assistance and resettlement alternatives to Evaluation Council to evaluate before submitting to provincial or district PC for approval (depending on the size of the project).
- For cases related to land recovery from two (02) districts, towns, cities or more, the Provincial Evaluation Council for compensation, assistance and resettlement will perform the evaluation. City Evaluation Council is chaired by leader of Department of Resources and Environment when its members are the leaders of the Department of Finance, Department of Construction and representatives of relevant agencies.
- For the case of land acquired by the State within one (01) district-level administrative units, the district evaluation Council for compensation, assistance and resettlement performs the evaluation. District evaluation Council is chaired by leader of district Natural Resources and Environment Division when its members are the leaders of the Department of Finance, Department of Construction and representatives of relevant agencies.

The responsibilities of the heads of functional departments and offices:

- DONRE shall assume the prime responsibility for evaluation of compensation, support and resettlement plans approved by the district People's Committees in which the price of land compensation, higher or lower support than the price of land by the CPC decided and announced by the CPC for approval prior to approving the compensation, support and resettlement.
- DOF is responsible for coordination with the DARD to guide, check to determine the level of compensation and compensation for crops and livestock as prescribed.
- DOC is responsible to guide to determine the price of houses and the construction works on the land to calculate the compensation and support for each affected persons.

4.2. Result of Survey

4.2.1. Survey Areas

Thuy Nguyen Rural District

Thuy Nguyen Rural District is about 20km from Haiphong City. Construct the Haiphong Ring Road no.3 component will affects the households and organizations in the communes Kenh Giang, Hoa Binh, An Lu, Thuy Trieu, Ngu Lao, Phuc Le, Pha Le and Lap Le. Construction Nguyen Trai Bridge component will affect to household and organizations in Duong Quan commune.

Survey team interviewed affected households and non affected households by the project. In addition, the survey team also surveyed the price of architectural objects from contractors, the household whose have constructed new house; and consulted land price through households who buy/ sell land within 3 years and the building materials shop to learn more about construction costs, building material price and land prices.

Hai An Urban District

Hai An Urban District is in Haiphong City. Construct the Vu Yen Bridge component will affect the households and organizations in Dong Hai 2 ward and Nam Hai ward. Affected objects mainly are aquaculture households and store yards of companies. However, proposed land area, is Dong Hai 1 commune on Vu Yen Island, is now belong to Project on construction the entertainment, homeland and ecopart in Vu Yen Island, Project owner is Vingroup. And nowadays, procedures relate to clearance for this Project is implementing.

Ngo Quyen Urban District

Construct the Nguyen Trai Bridge component will affect to households on Nguyen Trai Street belong to May To ward. These households are lost the house, homestead land and assets on land; and affect the surface water for agriculture of some households at Duong Quan commune, Thuy Nguyen Rural District.

Survey team interviewed affected households and non affected households by the project. In addition, the survey team also surveyed the price of architectural objects from contractors, the household whose have constructed new house; and consulted land price through households who buy/ sell land within 3 years and the building materials shop to learn more about construction costs, building material price and land prices.

At Duong Quan commune, Thuy Nguyen Rural District, survey team interviewed affected and non affected households about the conditions and benefits from production of aquaculture.

Scope of Study

For land: in each commune had 3 affected households and 3 non-affected households selected to interview. The interviews were also conducted with cadastral and construction-in charge staff of all the affected communes. In addition, the team also collected the land transaction contract in recent years and interviewed a number of households got the land transactions.

For Architectural objects: survey team conducted interviews with some households who have new houses constructed and construction material shops to learn more about construction costs and construction materials.

For fruit tree and crops: Almost affected objects are paddy land and water surface for aquaculture. So, the survey team conducted interviews with affected and non affected households own these types of land. In addition, the team also interviewed with agricultural products dealers and commune's staffs to supplement the information in each district.

4.2.2. Survey Results

Survey process to estimate the replacement cost for different types of damages, such as affected land (including homestead land, paddy land, garden land, aquaculture surface water...), damage to the architecture objects (including houses, subordinate facilities, graves...) and all kinds of fruit trees and crops on the land. Specifically, the survey results obtained are as follows:

4.2.2.1. Land

a. Homestead land

a.1. Thuy Nguyen Rural District

Haiphong Ring Road no.3 component will affect to homestead land in the communes Kenh Giang, Hoa Binh, An Lu, Thuy Trieu, Ngu Lao, Phuc Le, Pha Le and Lap Le.

When this component is carried out, Haiphong City will compensate according to the Decision no. 2970/ QD-UBND and assistant according to Decision no. 2680/QD-UBND.

According to Decision no. 2680/QD-UBND, Affected Households will be assisted as follow:

- Assistant level for self-resettlement households is 250,000,000vnd/ household (average area is about 100m²). Estimated cost for the self-resettlement household is 2,500,000vnd/ m².
- Assistant level for remove to new house: 5,000,000 – 7,000,000vnd/ household. Estimated cost is 100,000vnd/ m².
- Assistant level for settlement and stabilize production: 3,000,000vnd/ person. Estimation each household have 4 persons is 12,000,000vnd/ household, equivalent is 240,000vnd/ m².
- Assistant level for temporary housing rent: 12,000,000vnd/ household equivalent is 240,000vnd/ m².

Sum of above assistant items is about 3,080,000vnd/ m². (Beside, other assistant levels depend on location and purpose of recovered land plots).

Kenh Giang commune

Affected households are in NH10 (location 1). In this affected area, no land transaction is carried out in recent years. These transactions happen only in equavilent locations.

Through interview the affected and non affected households, price level that affected households offer about 8,000,000 – 10,000,000vnd/ m² depend on the location, area and shape of land plot. Non

affected households offer a price level they suppose is suitable, about 7,500,000 – 8,000,000vnd/ m2. Ordinary, affected households offer the higher than actual price.

In recent years, the actual transactions at equivalent locations with affected area, price is about 8,000,000vnd/ m2, however in transaction contracts, the prices is always lower than actual or at similar with promulgation prices (aim is decrease pay-taxes to State). Detail a tax is about 3,000,000vnd/ m2, and almost the transaction taxes are paid by assignor.

Unit price of Haiphong City at Decision no.2970/QD-UBND, Location 1 – affected area price land is 3,000,000vnd/ m2.

Assistant level of Haiphong City is according to Decision no. 2680/QD-UBND: Due to type of recovered land plot is homestead and business land, so these households will receive the assistant level for training, career changing, and job finding. The assistant level is 4 to 10% of land price. Estimation is about 6% of land price means 180,000vnd/ m2.

Assistant level according to Decision 2680/QD-UBND is 3,080,000 vnd/ m2.

Therefore price level of Haiphong City compensates and assists to affected households is about 6,260,000 vnd/ m2. In which, market price are 8,000,000vnd/ m2, higher 1.2 times than compensation, assistant price of Haiphong City.

Proposal on the Replacement Cost for homestead land in NH10 – Kenh Giang commune

Almost at survey locations, price of homestead land that were transferred in the market in the normal transaction conditions is higher than compensation price in Decision no.2970 and assistant level in Decision no.2680 about 1.2 times ($K = 1.2$). Therefore, the proposal unit price for compensation increase coefficient of unit price $K = 1.2$.

Hoa Binh commune

Haiphong Ring Road no.3 passes Hoa Binh commune and affect to households in inter-hamlet road.

Survey team interviewed the affected and non affected households, household have just transferred homestead land in affected area. Affected households offer the price level is about 3,000,000vnd/ m2. Non affected households offer a price level they suppose is suitable, about 2,500,000 – 3,000,000vnd/ m2.

Unit price of Haiphong City at Decision no.2970/QD-UBND is 500,000vnd/ m2.

Assistant level of Haiphong City in Decision no. 2680/QD-UBND is 3,080,000vnd/ m2.

Therefore price level of Haiphong City compensates and assists to affected households is about 3,580,000 vnd/ m2. In which, market price are 3,000,000vnd/ m2, lower than compensation, assistant price of Haiphong City.

Proposal on the Replacement Cost for homestead land in Hoa Binh commune

Almost at survey locations, price of homestead land that were transferred in the market in the normal transaction conditions is lower than compensation price in Decision no.2970 and assistant level in

Decision no.2680. Therefore, the proposal unit price for compensation will apply the unit price in Decision no.2970 and assistant level in Decision no.2680.

Trung Ha commune

Project passes Trung Ha commune and affect to households in inter-hamlet road.

Survey team interviewed the affected and non affected households, household have just transferred homestead land in affected area. Affected households offer the price level is about 3,500,000vnd/ m2. Non affected households offer a price level they suppose is suitable, about 3,000,000 – 3,500,000vnd/ m2.

Unit price of Haiphong City at Decision no. 2970/QD-UBND is 800,000vnd/ m2.

Assistant level of Haiphong City in Decision no. 2680/QD-UBND is 3,080,000vnd/ m2.

Therefore price level of Haiphong City compensates and assists to affected households is about 3,880,000 vnd/ m2. In which, market price are 3,000,000 – 3,500,000vnd/ m2 lower than compensation, assistant price of Haiphong City.

Proposal on the Replacement Cost for homestead land in Trung Ha commune

Almost at survey locations, price of homestead land that were transferred in the market in the normal transaction conditions is lower than compensation price in Decision no.2970 and assistant level in Decision no.2680. Therefore, the proposal unit price for compensation will apply the unit price in Decision no.2970 and assistant level in Decision no.2680.

Ngu Lao commune

Project affects to homestead land of households at some locations below:

- Ben Binh – Pha Rung section (PR359): from border with Thuy Trieu to end border of Ngu Lao commune (hereinafter frontline of PR359).
- Inter-commune road
- Inter-hamlet road

Survey team interviewed the affected and non affected households at different locations. Affected households offer the price level is about 9,000,000vnd/ m2 at frontline of PR359; and 3,500,000 – 4,000,000vnd/ m2 at inter-commune road; and 3,000,000vnd/ m2 at inter-hamlet road. Non affected households offer a price level they suppose is suitable, about 8,000,000 vnd/ m2; 3,500,000vnd/ m2; and 3,000,000vnd/ m2 respectively with above locations. In actually, affected households offer the higher than actual price.

Summary of land transaction in recent years in commune area show that: at frontline of PR359 (location 1) the transferred price is about 8,500,000vnd/ m2. This is the homestead land combine with business land.

According to the Unit price of Haiphong City, land price at frontline of PR359 is 3,500,000vnd/ m2; 800,000vnd/ m2 at inter-commune road and 600,000vnd/ m2 at inter-hamlet road.

Assistant level of Haiphong City is according to Decision no. 2680/QD-UBND: Due to type of recovered land plot is homestead and business land, so these households will receive the assistant level for training, career changing, and job finding. The assistant level is 4 to 10% of land price. Estimation is about 6% of land price means 210,000vnd/ m².

Assistant level of Haiphong City in Decision no. 2680/QD-UBND is 3,080,000vnd/ m².

Therefore price level of Haiphong City compensates and assists to affected households is about 6,790,000vnd/ m² at frontline of PR359; 3,880,000vnd/ m² at inter-commune road; and 3,680,000vnd/ m² at inter-hamlet road. In which, market price are 8,500,000vnd/ m² hitgher 1.2 times; and market price for inter-commune and inter-hamlet road is 3,500,000vnd/ m² và 3,000,000vnd/ m² respectively, these prices are lower than compensated and assisted price of Haiphong City.

Proposal on the Replacement Cost for homestead land in Ngu Lao commune

Almost at survey locations, price of homestead land that were transferred in the market in the normal transaction conditions at the frontline of PR359 is higher than compensation price in Decision no.2970 and assistant level in Decision no.2680 about 1.2 times ($K = 1.2$). Therefore, the proposal unit price for compensation increase coefficient of unit price $K = 1.2$.

Land price at locations inter-commune road and inter-hamlet road are lower than compensation price in Decision no.2970 and assistant level in Decision no.2680. So, the proposal unit price for compensation will apply the unit price in Decision no.2970 and assistant level in Decision no.2680.

Lap Le commune

Project affects to homestead land of households at some locations below:

- Ngu Lao – Lap Le inter-commune road: section from Lap Bridge to Lap Le clinic.
- Commune axe-road

In this affected area and surrounding areas, no land transaction is carried out in recent years. Survey team interviewed the affected and non affected households at different locations. Affected households offer the price level is about 4,500,000vnd/ m² at inter-commune road; and 3,000,000 – 3,500,000vnd/ m² at commune axe-road. Non affected households offer a price level they suppose is suitable, about 4,000,000 – 4,500,000vnd/ m²; and 3,000,000vnd/ m² respectively with above locations. In actually, affected households offer the higher than actual price.

Unit price of Haiphong City at Decision no. 2970/QD-UBND is 1,200,000vnd/ m² at inter-commune road and 800,000vnd/ m² at commune axe-road.

Assistant level of Haiphong City in Decision no. 2680/QD-UBND is 3,080,000vnd/ m².

Therefore price level of Haiphong City compensates and assists to affected households at inter-commune road and at commune axe-road respectively is about 4,352,000vnd/ m² and 3,880,000vnd/ m². In which, market price at above mention locations respectively are 4,000,000vnd/ m² and 3,000,000vnd/ m² lower than compensation, assistant price of Haiphong City.

Proposal on the Replacement Cost for homestead land in Lap Le commune

Almost at survey locations, price of homestead land that were transferred in the market in the normal transaction conditions is lower than compensation price in Decision no.2970 and assistant level in Decision no.2680. Therefore, the proposal unit price for compensation will apply the unit price in Decision no.2970 and assistant level in Decision no.2680.

a.2. Ngo Quyen Urban District

Nguyen Trai Bridge component will affect to homestead land of households living along the Nguyen Trai road in May To ward.

When this component is carried out, Haiphong City will compensate according to the Decision no. 2970/ QD-UBND and assistant according to Decision no. 2680/QD-UBND.

According to Decision no. 2680/QD-UBND, Affected Households will be assisted as follow:

- Assistant level for self-resettlement households is 400,000,000vnd/ household (average area is about 50m²). Estimated cost for the self-resettlement household is 8,000,000vnd/ m².
- Assistant level for remove to new house: 5,000,000 – 7,000,000vnd/ household. Estimated cost is 100,000vnd/ m².
- Assistant level for settlement and stabilize production: 3,000,000vnd/ person. Estimation each household have 4 persons is 12,000,000vnd/ household, equivalent is 240,000vnd/ m².
- Assistant level for temporary housing rent: 12,000,000vnd/ household equivalent is 240,000vnd/ m².

Sum of above assistant items is about 8,580,000vnd/ m². (*Beside, other assistant levels depend on location and purpose of recovered land plots*).

Recovered land area of Project, is in Nguyen Trai Road, May To ward, is separated into 2 locations: location 1 and location 2 according to the Decision no.2970. Because of the investment information of Project is public, so in recent years no LUR land transaction happens in this area.

Survey team conducted to interview a household, living in near the location 1 – near the affected area of Nguyen Trai component (address no.43 on Nguyen Trai Road), they want to housing transaction with the price 50,000,000vnd/ m² at location 1 and 40,000,000vnd/ m² at location 2. However, these are the prices of sellers offering but none of them are price were confirmed by any actual transaction contract. Regarding the households do not attend to sale their house in the affected area, the suitable price for housing transaction is about 38,000,000 – 40,000,000vnd/ m² (location 1) and 28,000,000 – 30,000,000vnd/ m² (location 2) and also depend on the location, area or shape of land plots. In actually, the sellers always offer the higher than the price that purchaser can accept.

There is only a housing transaction case at house no.20, Nguyen Trai Road, its floor area is 78.7m² and the height is 3-storey house, total buiding area is 143.5m² and other structure objects which are sold by auction at SHB Bank, Hong Bang branch in order to retiring the debits. Auction price is 4.4

billion vnd (including all of regulation taxes). After the general estimate minus construction cost and paid-taxes as state regulation, the average price of this transaction is about 40,000,000vnd/ m². Regarding the responsibility to pay the taxes, land transaction costs are charged by the assignor.

Location 1 at Decision no. 2970

Unit price of Haiphong City at Decision no. 2970/QD-UBND is 20,000,000vnd/ m².

Assistant level of Haiphong City is according to Decision no. 2680/QD-UBND: Due to type of recovered land plot combine homestead and business land, so these households will receive the assistant level for training, career changing, and job finding. The assistant level is 4 to 10% of land price. Estimation is about 6% of land price means 1,200,000vnd/ m².

Assistant level of Haiphong City in Decision no. 2680/QD-UBND is 8,580,000vnd/ m².

Therefore price level of Haiphong City compensates and assists to affected households is about 29,780,000vnd/ m². In which, market price is about 40,000,000vnd/ m² lower higher 1.5 times than compensation, assistant price of Haiphong City.

Location 2 at Decision no. 2970

Unit price of Haiphong City at Decision no. 2970/QD-UBND is 10,000,000vnd/ m².

Assistant level of Haiphong City in Decision no. 2680/QD-UBND is 8,580,000vnd/ m².

Therefore price level of Haiphong City compensates and assists to affected households is about 18,580,000vnd/ m². In which, market price is about 30,000,000vnd/ m² lower higher 1.5 times than compensation, assistant price of Haiphong City.

Proposal the Replacement Cost for homestead land in Nguyen Trai Road

Almost at survey locations, price of homestead land that were transferred in the market in the normal transaction conditions is higher than compensation price in Decision no.2970 and assistant level in Decision no.2680 about 1.5 times ($K = 1.5$). Therefore, the proposal unit price for compensation increase coefficient of unit price $K = 1.5$.

Table 1: Result of Homestead Land Survey

Unit: 1.000vnd/ m²

No	Type of land	Compensation price and assistant level of Haiphong City			Market price	Proposed compensation price
		Total	Compensation price at Decision no.2970	Assistant level at Decision no.2680		
I	Thủy Nguyên Rural District (*)					
1	Kenh Giang Commune					
	Location 1: New NH10	6260	3000	3260	8000	8000
2	Hoa Binh Commune					Price in Decision no.2970 and
	Inter-hamlet road	3580	500	3080	3000	
3	Trung Ha Commune					

No	Type of land	Compensation price and assistant level of Haiphong City			Market price	Proposed compensation price
		Total	Compensation price at Decision no.2970	Assistant level at Decision no.2680		
	Commune axe-road	3880	800	3080	3500	assistant level in Decision no.2680
4	Ngu Lao Commune					
	Location 1, Ben Binh – Pha Rung section on PR359	6790	3500	3290	8500	8500
	Inter-commune road	3880	800	3080	3500	Price in Decision no.2970 and assistant level in Decision no.2680
	Inter-hamlet road	3680	600	3080	3000	
5	Lap Le Commune					
	Inter-commune road	4352	1200	3152	4200	Price in Decision no.2970 and assistant level in Decision no.2680
	Commune axe-road	3880	800	3080	3000	
II	Ngo Quyen Urban District					
1	Location 1: Nguyen Trai Road	29780	20.000	9780	40000	40000
2	Location 2: Nguyen Trai Road	18580	10.000	8580	30000	30000

(*) Affected land plots in Thuy Nguyen Rural District were studied at location 1- by Decision no.2970

b. Agricultural land

The implementation of Project leads to recover the agricultural land of households (mostly are paddy land and aquaculture surface water) of communes in Thuy Nguyen Rural District and Hai An Urban District.

In fact, local transactions of agricultural land are not rather frequently carried out.

When interviewing people about land prices under rice and other annual crops, the price in general is not different at locals in the Project area. Prices are offered in ranged between 250,000 - 350,000vnd/m² depend on different locations. While the compensation price according to compensation price of Haiphong City is 60,000 VND/m² which is lower than actual prices.

However, According to Decision no. 2680, the assistant level is equivalent to 5 times the price of agricultural land for the total recovered agricultural land, but not to exceed the agricultural land allocation limit at local. Therefore, although stipulated compensation land prices is lower than actual prices, but thank to the support coefficient $k = 5$, so compensation land prices are higher than the market land price.

Table 2: Result of Agricultural Land Price Survey*Unit: 1.000vnd/ m²*

No	Type of land	Land price as Decision no.2970	Total received compensation including assistance, for affected households (*)	Survey land price	Proposed compensation price
1	Paddy and annual crop land	60	360	250-300	Price in Decision no.2970 and assistant level in Decision no.2680
2	Aquaculture surface water	48		80	80
3	Aquaculture surface water in Hai An Urban District	80		80	Price in Decision no.2970 and assistant level in Decision no.2680

(*): Paddy and annual crop land supported 5 times at Decision no.2680. The figures in this column stand for the sum of land price and assistance equal to 5 times of the land price.

Regarding aquaculture surface water: the price that people commonly make in the range of 70,000 – 80,000vnd/ m². While compensation price is 48,000vnd/ m² in Thuy Nguyen Rural District lower 1.66 times (K=1.66) than actual prices; and compensation price at Hai An Urban District is 80,000vnd/ m² same with the actual price.

Proposal on the Replacement Cost for agricultural land

Current compensation price for paddy land and annual crops of Haiphong City is lower than the market price, but when the assistance policy by Decision no.2680 applies, the compensation price for the agricultural land that people are actually getting is higher than the market price. Therefore, the proposal unit price for compensation will apply unit price in Decision no.2970 and assistant level in Decision no.2680.

Aquaculture surface water: the proposal unit price for compensation at Thuy Nguyen Rural District increase coefficient of unit price K = 1.66; and at Hai An Urban District apply the unit price in Decision no.2970 and assistant level in Decision no.2680.

c. Business land

Vu Yen Bridge component will affect to good yards of companies in Nam Hai ward, Hai An Urban District.

Through these yards survey show that, a part of yards are belong to companies using of state land, another is capitalized and turned into the company's possession. However, up to now, there is no transaction contracts in the market. Therefore, the proposal unit price for compensation is applied as promulgated policies of Haiphong City.

4.2.2.2. Survey on Architectural Objects

A survey in affected communes by the project, the survey team found that the difference in construction price between communes and districts is not much.

Team survey conducted to interviews with the households whose houses have constructed, the constructors and owners of construction material shops. Construction price of people is about 4,500,000 – 5,500,000vnd/ m². These prices are all-in price between people and constructors. Promulgated compensation price in Decision no.324 is appropriate with actual price level, detail as below:

- Construction price of 1 storey-house in market is between 4,000,000-5,000,000vnd/ m² floor. The compensation unit rates prescribed by the province ranged from 4,593,892– 5,161,741vnd/ m² and can be adjusted depending on the type of material used.
- Similarly for the architectural objects with no significant difference between promulgated prices in Decision no.324 and actual construction cost, therefore absolutely apply these compensation prices for reconstruction affected architectural objects.

Table 3: Result of Architectural Objects Survey

No	Item	Structure	Decision no,324	Architectu ral objects price	Proposed compensation price
1	1 storey-house with the wall-bearing structure; 3.5m of height; without salnitary block				
	Wall is constructed by brick 220	Tiles roof, solid brick fourndation	5,161,741	5,000,000	According to Decision no.324 of Haiphong City
		Metal roof, solid brick fourndation	4,658,432	4,500,000	
		Fibrocement roof, solid brick fourndation	4,593,892	4,300,000	
		Tiles roof, stone foundation	5,074,334	4,800,000	
	Wall is constructed by brick 110	Tiles roof, solid brick fourndation	4,735,018	4,500,000	
		Metal roof, solid brick fourndation	4,270,456	4,000,000	
		Fibrocement roof, solid brick fourndation	4,205,917	4,000,000	
		Tiles roof, stone foundation	4,686,359	4,400,000	
2	1 storey-house with the wall-bearing structure; 3.5m of height; with salnitary block				
	Wall is constructed by brick 220	Tiles roof, solid brick fourndation	5,752,275	5,500,000	According to Decision no.324 of Haiphong City
		Metal roof, solid brick fourndation	5,248,965	5,000,000	
		Fibrocement roof, solid brick fourndation	5,184,425	5,000,000	
		Tiles roof, stone foundation	5,664,867	5,500,000	
	Wall is constructed by brick 110	Tiles roof, solid brick fourndation	5,328,333	5,200,000	
		Metal roof, solid brick fourndation	4,863,573	4,600,000	
		Fibrocement roof, solid brick fourndation	4,804,760	4,600,000	
		Tiles roof, stone foundation	5,279,545	5,000,000	
3	2 storey-house; wall-bearing structure; height of the first deck is 3.9m; second deck is 3.5m; with salnitary block				

No	Item	Structure	Decision no,324	Architectural objects price	Proposed compensation price
	Wall first and second deck are constructed by brick 220	Tiles roof, brick foundation	3,725,682	3,500,000	According to Decision no.324 of Haiphong City
		Metal roof, brick foundation	3,512,259	3,500,000	
		Fibrocement roof, brick foundation	3,456,847	3,400,000	
		Tiles roof, stone foundation	3,725,682	3,500,000	
		Tiles roof, stone foundation	3,512,259	3,400,000	
	Brick-220 wall of first deck; brick-110 wall of second deck	Tiles roof, brick foundation	3,710,235	3,500,000	According to Decision no.324 of Haiphong City
		Metal roof, brick foundation	3,496,824	3,400,000	
		Fibrocement roof, brick foundation	3,442,247	3,400,000	
		Tiles roof, stone foundation	3,664,953	3,500,000	
		Tiles roof, stone foundation	3,455,847	3,300,000	
4	3 storey-house and more stories; height of the first deck is 4.5m; second deck is 4.1m; third deck is 3.5m with salnitary block				
	Wall-bearing structure; brick-220 wall at first and second deck; brick foundation	Tiles roof, brick-220 wall at third deck	3,803,637	3,600,000	According to Decision no.324 of Haiphong City
		Tiles roof, brick-110 wall at third deck	3,550,699	3,500,000	
		Tiles roof, wall at third deck is built by perforated brick with 6 holes, diameter 150.	3,669,761	3,500,000	
		Tiles roof, wall at third deck is built by perforated brick with 6 holes, diameter 110	3,653,752	3,500,000	
		Metal roof, brick-220 wall at third deck	3,656,363	3,500,000	
	Frame, roof and foundation of house is constructed by reinforced concrete	Wall of 3 decks is constructed by brick-220	4,257,965	4,000,000	According to Decision no.324 of Haiphong City
		Wall of 3 decks is constructed by brick-110	3,960,518	3,700,000	
		Wall of 3 decks is constructed by as perforated brick with 6 holes, diameter 150 in a straight line	3,911,863	3,700,000	
		Wall of 3 decks is constructed by as perforated brick with 6 holes, diameter 110 in a sloping line	3,839,721	3,600,000	
		Brick-220 wall at first and second deck; and brick-110 wall at third deck	4,100,314	4,000,000	

4.2.2.3. Removal of Graves

- **Earth grave:** compensation price for earth grave is 6,000,000 – 7,500,000vnd/ grave, and survey price also ranges 4,000,000 – 4,500,000vnd/ grave (exclude land cost). Such compensation rates could totally help to move the affected graves.

- **Built grave:** The price on enumeration areas have fluctuated between 5,000,000 –9,000,000vnd/ grave depending on building structure. According to the compensation unit rates of Haiphong City is 6,500,000 – 10,000,000vnd/ grave is compensated for the earthworks and compensation for construction response based on detail material volume and construction price. Therefore, it can be said that regulated compensation for a common grave is equivalent to a locally constructed grave.

Table 4: Result of Grave Removal Survey

Unit: 1.000vnd

No	Item	Structure	Decision no.324/2015/QD-UBND issued by Haiphong CPC			Architectural objects survey cost	Proposed compensation price
			Total	Construction cost	Assistant level (1)		
1	Earth grave		6000 - 7500	2500	3500-5000	4000-4500	Compensation price at Decision no.324
2	Simple built grave	Volume < 0.4m ³	6500 - 8000	3000	3500-5000	5000-6000	
		Volume 0.4 – 0.6m ³	7000 - 8500	3500	3500-5000	6000-7000	
		Volume > 0.6m ³	8000 - 9500	4500	3500-5000	7000-8000	
3	Special-structural built grave		8000 – 9500 and (2)	4500	3500–5000 and (2)	8000-9000	

(1) Assistant level including:

- a. Cost for removal from 1,500,000 – 3,000,000vnd/ grave
- b. Cost for worship procedures: 2,000,000vnd/ grave

(2): Cost for ashlar paving stone are pressed outside the grave

Proposal on the Replacement Cost for architectural objects

Compensation price for architectural objects specified in Decision no.324 can meet market price for new construction and relocation of affected house and architectural objects,

4.2.2.4. Fruit Trees and Crops

In the survey area, most trees, bonsai and crops... are cultivated in gardens area of each affected households, quantity of these affected objects are not much, but is diverse on the species of trees. The survey shows that these trees only supply for family's demand. Survey prices is based on the estimation on benefit source of trees, these prices are relatively little difference between the communes. Overall survey price showed that compensation rates for fruit trees and subsidiary crops in Decision 58/2015/QD-UBND of Haiphong CPC province is relatively close to the market price.

Table 5: Result of Fruit Trees and Crop Survey

No	Tree, group of tree	Unit	Compensation cost at Decision no.58	Survey price	Proposed compensation price
I	Fruit trees				
1	Graph fruit, age of tree over 5 years, able to harvest	tree	1,200,000	1,000,000	Decision no.58 of Haiphong CPC
2	Lemon big tree, have just harvested	tree	120,000	100,000	
3	Harvested papaya tree	tree	140,000	120,000	
4	Sapodilla tree/ star apple tree/ rose apple tree able to harvest	tree	300,000	300,000	
5	Harvested jackfruit tree	tree	600,000	500,000	
6	Harvested tamarind tree	tree	500,000	500,000	
7	Harvested carambola tree	tree	700,000	500,000	
8	Harvested eggfruit tree	tree	300,000	300,000	
9	Harvested apple tree	tree	240,000	200,000	
10	Harvested guava tree	tree	250,000	250,000	
11	Harvested mango tree	tree	1,000,000	1,000,000	
12	Dracontomelum tree have just taken root	tree	400,000	400,000	
13	Orange or camborine tree with age of tree over 5 years	tree	400,000	400,000	
14	Harvested oleaster tree	tree	150,000	150,000	
15	Harvested longan tree	tree	1,000,000	1,000,000	
II	Shade tree				
1	Devil tree	tree	72,000	70,000	Decision no.58 of Haiphong CPC
2	Camphor tree	tree	120,000	100,000	
3	Flamboyant/ Cassia trees	tree	150,000	150,000	
4	Yellow flamboyant/ violet cassia/ queen-tree/ crape myrtle tree	tree	120,000	120,000	
5	Tropical almond tree/ Kapok tree have just taken root	tree	200,000	200,000	
6	Gum tree/ casuarina/ Acacia mangium/ china tree have just taken root (D>30 cm)	tree	120,000	100,000	
7	Conch have just taken root (D=15-40)	tree	300,000	300,000	
8	Coral/ Fig-tree	tree	100,000	100,000	
III	Annual Crop				
1	Paddy	m ²	8,000	6,500	Decision no.58 of Haiphong CPC
2	Soybean	m ²	6,000	6,000	
3	Water-taro, sweet potato	m ²	4,500	4,000	
4	Taro, potato	m ²	8,000	7,000	
5	Corn	m ²	6,000	6,000	

No	Tree, group of tree	Unit	Compensation cost at Decision no.58	Survey price	Proposed compensation price
6	Peanut, Sesame	m ²	8,000	8,000	
7	Green bean, Black bean	m ²	6,500	6,500	
8	Tomato	m ²	10,000	8,000	

Proposed the Replacement Cost for fruit tree and crop

For affected trees, provincial compensation price is relatively close compared to the market price

V. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

- *Homestead land*: Land unit prices based on Decision No. 2970 are lower than the market price. However the sum of the unit price and assistant levels based on Decision No. 2680 are principally higher than the market price. Therefore, total compensation price that people can receive may be similar with market price, except the complex case of homestead and business land (households are in the NH10, PR359). The market price is generally higher 1.2 times than publicized unit price at Thuy Nguyen District) and 1.5 times at in Nguyen Trai Road of Ngo Quyen District).
- *Agricultural land* Land unit price attached in Decision no.2970 much lower than the market price at the time of survey. However, beside the compensation price is promulgated in Decision no.2970, farmer still supported career change and job creation by Decision no. 2680. Therefore, compensation cost for the recovery land is similar or event higher than market price for agricultural land.
- *Business land*: Proposed compensation unit price will be applied as in Decision no. 2970 and assistant level is in Decision no. 2680.
- *Architectural objects*: Proposed compensation unit price will be applied as in Decision no.324 issued by Haiphong CPC.
- *Fruit tree and crop*: Proposed compensation unit price will be applied as in Decision no.58 issued by Haiphong CPC.

5.2. Recommendations on unit price application

- *Rural homestead land*: Compensation unit price for homestead and combine with business land will apply coefficient $K = 1.2$ increase with promulgated compensation price; compensation unit price for homestead land at other locations will apply the compensated unit prices as regulations of Haiphong CPC (detail, see at Table 1).
- *Urban homestead land (Nguyen Trai road – May To ward – Ngo Quyen Urban District)*: should apply coefficient $K = 1.5$ increase with with promulgated compensation price.

- *Business land*: apply the compensation price and assistant level is promulgated polycies.
- *Agricultural land (paddy land)*: apply the compensation price and assistant level is promulgated polycies.
- *Aquacultural surface water*: apply coefficient $K = 1.66$ at Thuy Nguyen Rural District and apply the compensation price and assistant level is promulgated polycies at Hai An Urban District.
- *Architectural objects and fruit tree and crop*: apply the current unit price of Haiphong CPC.

APPENDIX

Appendix 1: LIST OF INTERVIEWEE

No	Full name	Address	Investigation Object
I	<i>Thuy Nguyen Rural District</i>		
1	Lê Văn Sơn	Land Fund Development Central	Deputy director
I.1	<i>Kênh Giang commune - Thuy Nguyen Rural District</i>		
1	Lương Văn Hoạch	Commune People committee	staff
2	Nguyễn Thị Mến	ditto	staff
3	Lê Xuân Nghị	ditto	staff
4	Lương Văn Hùng	Cổng Tranh Hamlet	Affected Household
5	Nguyễn Đăng Toàn	Hamlet no. 7	HH with land transactions
6	Nguyễn Việt Trung	Ông Kiếm Alley	HH with land transactions
7	Đoàn Thị Thê	Trại Kênh Hamlet	HH with land transactions
8	Nguyễn Tiến Hùng	Trại Kênh Hamlet	HH with land transactions
I.2	<i>Hòa Bình commune - Thuy Nguyen Rural District</i>		
1	Trịnh Thị Lệ	Commune People committee	staff
2	Nguyễn Duy Tuyên	ditto	staff
3	Trần Văn Hân	ditto	staff
4	Trần Quốc Hanh	ditto	staff
5	Phạm Văn Chiến	Hamlet no.11	Affected Household
6	Trần Văn Xá	Hamlet no.11	Affected Household
7	Phạm Văn Khiết	Hamlet no.11	Affected Household
8	Trịnh Văn Cảnh	Hamlet no.4	Non-affected HH
9	Phạm Văn Khê	Hamlet no.3	Non-affected HH
10	Trần Văn Dính	Hamlet no.11	Non-affected HH
11	Trần Văn Minh	Hamlet no.9	HH with land transactions
12	Trần Quốc Trung	Hamlet no.8	HH with Constructed Housing
13	Phạm Văn Song	Hòa Bình Hamlet	HH sell construction materials
14	Trần Văn An	Hòa Bình Hamlet	HH sell construction materials
I.3	<i>An Lư commune - Thuy Nguyen Rural District</i>		
1	Phạm Văn Giang	Commune People committee	staff
2	Bùi Văn Hà	Commune People committee	staff
3	Hoàng Văn Thành	Commune People committee	staff
4	Trần Thị Nường	Xim Hamlet	Affected Household
5	Nguyễn Thị Nghị	Xim Hamlet	Affected Household
6	Vũ Văn Bản	Xim Hamlet	Affected Household
7	Phan Thị Đằm	An Bình Xim Hamlet	Affected Household
8	Phạm Văn Tự	Bắc Xim Hamlet	Non-affected HH
9	Nguyễn Minh Ngọc	An Hồ Xim Hamlet	Non-affected HH
10	Bùi Thị Ra	Xim Hamlet	Non-affected HH
11	Trần Văn Thiệu	Xim Hamlet	Non-affected HH
I.4	<i>Thủy Triều commune - Thuy Nguyen Rural District</i>		

No	Full name	Address	Investigation Object
1	Lê Văn Hường	Commune People committee	staff
2	Trần Văn Tuấn	Commune People committee	staff
3	Lê Văn Sáu	Commune People committee	staff
4	Trần Văn Tuyên	Commune People committee	staff
5	Đỗ Văn Bác	Hamlet no. 5	Affected Household
6	Đỗ Thị Cò	Hamlet no.5	Affected Household
7	Nguyễn Văn Đĩnh	Giữa Hamlet	Affected Household
8	Nguyễn Văn Lim	Đông Hamlet	Non-affected HH
9	Nguyễn Thị Lịch	Giữa Hamlet	Non-affected HH
10	Nguyễn Văn Tư	Giữa Hamlet	Non-affected HH
11	Đỗ Quang Đại	Đông Hamlet	HH with land transactions
12	Trần Văn Thành	Hamlet no. 5	HH with land transactions
13	Đỗ Văn Biên	Thủy Triều Hamlet	HH sell construction materials
I.5	Trung Hà commune - Thuy Nguyen Rural District		
1	Bùi Văn Hoan	Commune People committee	staff
2	Nguyễn Văn Hiến	Commune People committee	staff
3	Bùi Văn Rục	Commune People committee	staff
4	Nguyễn Thị Tới	Đình Hamlet	Affected Household
5	Nguyễn Văn Thuận	Tây Hamlet	Affected Household
6	Nguyễn Văn Cảnh	Đình Hamlet	Non-affected HH
7	Nguyễn Sơn Thạch	Đông Hamlet	Non-affected HH
8	Bùi Đức Sinh	Đình Hamlet	Non-affected HH
I.6	Ngũ Lão commune - Thuy Nguyen Rural District		
1	Nguyễn Văn Bích	Commune People committee	staff
2	Hoàng Văn Đại	Commune People committee	staff
3	Lâm Văn Pháng	Commune People committee	staff
4	Nguyễn Văn Quý	Commune People committee	staff
5	Hoàng Thị Múc	Hamlet no. 10	Affected Household
6	Bùi Văn Bằng	Hamlet no. 10	Affected Household
7	Trịnh Thị Chiên	Group no.11 – Ngũ Lão Hamlet	Affected Household
8	Lê Thị Hiến	Commune People committee	HH with Constructed Housing
9	Nguyễn Văn Toán	Hamlet no. 8	HH with land transactions
10	Lê Thế Hùng	Hamlet no. 14	HH with land transactions
11	Đình Thị Vĩnh	Ngũ Lão Hamlet	HH sell construction materials
12	Đình Khắc Tuấn	Ngũ Lão Hamlet	HH sell construction materials
I.7	Phả Lễ commune - Thuy Nguyen Rural District		
1	Đình Thị Nhân	Hamlet no. 1	Non-affected HH
2	Lê Văn Bình	Commune People committee	staff
3	Trần Văn Minh	Commune People committee	staff
4	Đình Khắc Tuyên	Commune People committee	staff
5	Đình Thị Nhái	Hamlet no. 3	Affected Household

No	Full name	Address	Investigation Object
6	Đinh Thị Thêm	Hamlet no. 3	Affected Household
7	Lê Khắc Nga	Hamlet no. 1	Non-affected HH
8	Đinh Thị Hoan	Hamlet no. 1	Non-affected HH
I.8	Lập Lễ commune - Thuy Nguyen Rural District		
1	Vũ Thị Ngọt	Commune People committee	staff
2	Vũ Văn Nghĩa	Commune People committee	staff
3	Nguyễn Văn Hoàng	Commune People committee	staff
4	Nguyễn Đức Điệp	Group no.3	Affected Household
5	Nguyễn Đức Đàng	Group no.9	Non-affected HH
6	Đinh Thị Vân	Group no.3	Affected Household
7	Đinh Thị Đa	Group no.3	Non-affected HH
8	Đinh Khắc Tâm	Group no.12	Non-affected HH
9	Vũ Thị Lư	Lập Lễ Hamlet	HH sell construction materials
10	Vũ Đình Hòe	Lập Lễ Hamlet	HH sell construction materials
I.9	Dương Quan commune - Thuy Nguyen Rural District		
1	Lê Hữu Thái	Commune People committee	staff
2	Nguyễn Thị Tuyết	Commune People committee	staff
3	Lê Văn Vát	Tây nhà thờ Hamlet	Affected Household
4	Lê Thành Trung	Tây giữa Hamlet	Affected Household
5	Bùi Thị Quyết	Đông nhà thờ Hamlet	Non-affected HH
6	Hoàng Liên Sơn	Đông nhà thờ Hamlet	Non-affected HH
II.2	Ngô Quyền Urban District		
II.2.1	Máy Tơ Ward		
1	Nguyễn T. Quỳnh Vân	Ward People committee	staff
2	Nguyễn Văn Tĩnh	Ward People committee	staff
3	Nguyễn Văn Thọ	Ward People committee	staff
4	Nguyễn Văn Cường	Ward People committee	staff
5	Nguyễn Hoàng Minh	House no. 20- Nguyễn Trãi Road	Affected Household
6	Đặng Văn Dưỡng	House no. 25- Nguyễn Trãi Road	Non-affected HH
7	Lê Thị Vườn	House no. 50 – Nguyễn Trãi Road	Affected Household
8	Kiều Thị Nghĩa	House no. 47 – Nguyễn Trãi Road	Non-affected HH
9	Nguyễn Thị Nhung	House no. 21/56 – Nguyễn Trãi Road	Non-affected HH
10	Phạm Bá Vinh	House no. 40 – Nguyễn Trãi Road	Affected Household
11	Đinh Thị Liên	Máy Tơ Ward	HH sell construction materials
12	Nguyễn Thanh Sơn	Máy Tơ Ward	HH sell construction materials

APPENDIX 2: REPLACEMENT COST SURVEY FORM

Commune/ward: District: Haiphong City

Interviewees:; Position:

1 Land

No.	Type of land	Market price (1.000 vnd/m ²)	Location	Legal status
1	Homestead land			
2	Bussiness land			
3	Garden land			
4	Annual paddy crop land			
5	Perennial tree land			
6	Subsidiary crop land			
7	Aquaculture surface water			
8	Forest land			
9	Other			

2. Houses, assets

No.	Types	Unit	Local construction price (1.000 vnd/m ²)	Note
1				
2				
3				
4				
5				
6				
7				
8				
9				

....				
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3. Trees

No.	Types of industrial trees/ Timber trees	Unit (by age of tree/ size, height and diameter)	Amount (1.000 vnd)	Note
1				
2				
3				
4				
5				
6				
7				
8				
9				
...				

4 UNIT PRICE OF BUILDING MATERIALS AND LABOR

No.	Type of materials	Unit	Amount (1.000 vnd)	Note
1	Local cement	1.000 vnd /quintal		
2	Cement.....	1.000 vnd /quintal		
3	Cement.....	1.000 vnd /quintal		
4	Iron Ø 6 + Ø 8	1.000 vnd /kg		
5	Iron Ø 12	1.000 vnd /cây		
6	Iron Ø 14	1.000 vnd /cây		
7	Iron Ø 16	1.000 vnd /cây		
8	Stone 1× 2 (or 3 × 4) or gravel	1.000 vnd /m ³		
9	Construction sand (black sand)	1.000 vnd /m ³		

No.	Type of materials	Unit	Amount (1.000 vnd)	Note
10	Yellow sand (concrete)	<i>1.000 vnd /m³</i>		
11	Local red brick (made by local workshop)	<i>1.000 vnd /brick</i>		
12	Red brick (made in factory)	<i>1.000 vnd / brick</i>		
13	Brick.....	<i>1.000 vnd /brick</i>		
14	Brick.....	<i>1.000 vnd / brick</i>		
15	Fibrocement roof	<i>1.000 vnd /slab</i>		
16	Local red tile	<i>1.000 vnd /pieces</i>		
17	Red tile.....	<i>1.000 vnd / pieces</i>		
18	Construction labor (worker)	<i>1.000 vnd /man-day</i>		
19	Construction labor (auxiliary worker)	<i>1.000 vnd /man-day</i>		
20	Construction labor (Unskilled worker)	<i>1.000 vnd /man-day</i>		

Date Month Year 2015

Interviewer

Interviewees

APPENDIX 3: INTERVIEW MINUTE OF HOUSEHOLDS

Interviewees: Mr. Lương Văn Hoạch, Kênh Giang commune, Thủy Nguyên Rural District, Haiphong City

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: In the recent years, there are few household conducted the land transaction. And if any transaction between seller and purchaser, they almost no need the land transaction contract.

Q: Why is only little transaction locally happen?

A: I am not clear about the reason why, I guess that in general, homestead land of households living there is rather large and mostly were inherited/ partitioned by their parent, and if anyone wants to buy land they also have no money to do it.

Q: How much does the homestead land cost?

A: I don't know exactly, however, base on the homestead land prices of some households purchased in recent years at NH10 – location 1 are about 8,000,000 – 10,000,000vnd/ m² depend on the each locations. But in the contracts these prices are only 3,000,000 – 3,500,000vnd/ m².

Q: Do you think at the moment, how much does the square-meter of homestead land cost?

A: I am not sure, because there is no transaction in long time, however at the frontline of NH10, the price at least must be 8,000,000vnd/ m² if someone have the really need to buy.

Q: How much do the garden land or pond cost in this area?

A: There is no garden/ pond land in the homestead land plot because the most of homestead land in our commune were confirmed since 1990, so the garden/pond land is not considered as homestead land. However, price of perennial crops land (garden land) and annual crop land may be 200,000vnd/ m².

Q: How much does the agricultural land cost?

A: Price of paddy land is about 200,000vnd/ m² and more depend on the location of paddy land.

Q: Is it right to say that houses are popularly built in solid structure in this area?

A: Yes, it is.

Q: How much does it cost per square meter to build such a solid structure house?

A: It depends on type of the house, and depends on the structure; generally, it is about 4,000,000 – 500,000,000vnd/constructed m².

Q: How much is wages for worker per day to building the house?

A: Construction worker is about 250,000 – 300,000vnd/ man-day; auxiliary worker is about 250,000 – 300,000vnd/ man-day.

Q: Do you know about the cost of construction materials sold in this area?

A: I am not quite clear about the prices of all materials, but I may know some.

Q: How is about the price of cement?

A: It is about 1,500 VND/kg.

Q: How is about the price of iron steel?

A: Depend on the iron, as iron Ø 6 or Ø 8 is about 13,000vnd/ kg.

Q: Do your family plant any banana?

A: Yes, I do

Q: How much you can get income from a banana tree?

A: In average, we can get 100,000 VND, more or less it depends the growth of tree.

Q: How about other kinds of tree are?

A: 1,000,000 VND/longan tree, 800,000 VND/mango tree...

Q: How is about price of paddy per kilogram?

A: It is about 6,500VND/kg.

Interviewees: Mr. Lương Văn Hùng, Kênh Giang commune, Thủy Nguyên Rural District, Haiphong City

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: Yes, my household is impacted.

Q: Is there any land transactions were carried out in this area?

A: There is no land transaction. If any, may be it happens in other hamlet.

Q: Why is only little transaction locally happen?

A: I don't know, may be demand to buy more land of people around here is not much. Though, homestead land of households living there is rather large and if it is necessary they can partition for their childrens, grandchild, so they no need to purchasing or selling. Regards with the small area, if they want to buy more land, they also have no money to do it.

Q: How much does the agricultural land cost?

A: Price of paddy land is about 250,000 – 300,000vnd/ m².

Q: How much do the price of garden land or aquacultural surface water cost in this area?

A: I am not clear about these prices.

Q: What kind of trees do you plant?

A: Banana, jackfruit, longan, mango, eucalyptus...

Q: Can you estimate the money you get if these trees are harsveted per year?

A: 500,000vnd/ a mango tree, 300,000vnd/ a longan tree, 800,000/ a jackfruit tree, 90,000vnd/ a banana... it is unspecifi.

Q: How is about price of paddy per kilogram?

A: It is in range 6,000 – 7,000vnd/kg, although in this year there are many different price levels at different moments.

Q: How much does it cost per square meter to build a house?

A: My house has been not constructed new in recent years, but some household have been constructed, price is about 4,000,000 – 500,000,000vnd/constructed m².

Q: How much is wages for worker per day?

A: Is about 200,000 – 300,000vnd/ man-day if hiring the construction worker.

Q: Do you know about the cost of construction materials?

A: Price of cement is about 1,500vnd/kg, sand is 380,000vnd/m³.

Q: How about the construction iron?

A: I am not sure, maybe in a range 12,000-13,000vnd/kg.

Trịnh Thị Lệ, Hòa Bình commune, Thủy Nguyên Rural District, Haiphong City

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: There are a few land transactions. Some households have just transferred homestead land.

Q: How much does the homestead land cost?

A: Actually, they transferred with the price is about 3,000,000vnd/ m² but in the land transaction contract, it is only 500,000vnd/ m².

Q: How much does the garden land cost?

A: I don't clear the price of garden in other locals, but in Hoa Binh commune, there is no garden land in the homestead land, because total area of each household mostly are rather small, average is 100m².

Q: How much does the agricultural land cost?

A: Agricultural land, detail is paddy land sometime is transferred more frequent; price is in range 250,000 – 300,000vnd/ m².

Q: What kind of fruittree do you plant?

A: There are many kinds of fruittree, as you see, banana, guava, jackfruit, lemon, mango, carambola...

Q: Can you estimate the money you get if these trees are harvested per year?

A: In the harvest this year, I have just calculated cursorily show that this harvest is rather good, 60,000vnd/ a banana tree, 100,000vnd/ a custard-apple tree, 200,000vnd/ a guava tree, 500,000vnd/ a jackfruit tree, and same price 1,000,000 for both a longan and mango tree...

Q: It is rather good, isn't it?

A: Yes, it is. Each tree is each kind. But mostly are for family's demand. So price is only estimated.

Q: How much does the paddy price cost in this year?

A: Its price is unstable, this year, it change from 5,000 – 7,000vnd/kg

Q: Average price is?

A: Is about 6,500vnd/ kg.

Q: Do you plant the timber tree?

A: No, I don't, there is no land for that.

Q: How much does it cost per square meter to build a house in your local?

A: Well, I don't clear much about that. But I think it takes about 4,000,000 – 5,000,000vnd/m² depends on structural type and size of house.

Q: How much is wages for worker per day?

A: Is about 200,000 – 300,000vnd depending on detail work items.

Q: How about the price hiring the agricultural worker?

A: I don't clear. Price to hiring the harvester is 300,000vnd/ man-day. And sometime, we can't hire anyone, because there are too many tenants, and special in the weather conditions in this year, so the hiring price is higher is acceptable.

Q: Do you know about price of construction material such as iron, sand, cement...?

A: I don't know.

Q: Thanks alot!

Phạm Văn Chiến, Hamlet no.11 - Hòa Bình commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: Yes, my household is impacted.

Q: Is there any land transactions were carried out in this area?

A: Price of homestead land in my local, if is transferred may be the price will be 3,000,000vnd/ m².

Q: Do you know the promulgated compensation price for recovery agricultural land?

A: It seems 60,000vnd.

Q: How much does it cost per a square-meter of agricultural land you want to sell at the moment?

A: If I want to buy the paddy field, I will accept the price level 250,000 – 300,000vnd/ m²

Q: How is about the price before?

A: About 200,000vnd.

Q: How much is wages for worker per day to building the house?

A: Construction worker is about 250,000 – 300,000vnd/ man-day; auxiliary worker is 200,000vnd/ man-day.

Q: How much is wages for worker per day?

A: I do not clear. Price for hiring the harvester is about 300,000vnd/ man-day, and sometime we can't hire anyone because in the harvest, there are many households want to hire the harvester.

Q: Do you know about price of construction material

A: Sand is about 400,000vnd/ m³

Q: And price cement?

A: About 1,500vnd/ kg

Q: How is about price of iron/steel?

A: About 13,000vnd/kg

Q: How much do these trees cost?

A: I don't know. As you see, there is no tree here.

Q: Thanks alot!

Trần Văn Đình, Hamlet no.11 - Hòa Bình commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: There are a few households have just transferred homestead land, agricultural land, but not much.

Q: How much does the homestead land cost?

A: A household have transferred with the price is about 3,000,000vnd/ m².

Q: If you also to sell your homestead land? How much does it cost?

A: I think same as the transferred households

Q: Means 3,000,000vnd/ m²?

A: That's right.

Q: How much does the paddy land cost?

A: About 200,000 – 300,000vnd/ m².

Q: How much does it cost per square meter to build a house in your local?

A: I don't know.

Q: How much is wages for worker per day to building the house?

A: It seems about 200,000 – 300,000vnd/ man-day if I do not mistake.

Q: How much is wages for worker per day to building the other items?

A: I do not clear, but I think it may be same with the construction man-day because they are the construction.

Q: Do you know the price of construction material?

A: I don't know, for along time I don't care these things like that.

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

A: I think it's about 80,000vnd/ a banana tree, 500,000vnd/ a jackfruit tree and 700,000vnd/ a mango tree.

Q: How much does the paddy price cost in this year?

A: About 6,500vnd/ kg.

Q: Thanks alot!

Trần Văn Xá, Hamlet no.11 - Hòa Bình commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: Yes, my household is impacted.

Q: Is there any land transactions were carried out in this area?

A: There are much the land transaction at the frontline of PR359, and fewer at the hamlet because at the frontline of PR359, homestead land can combine with business.

Q: How much does the homestead land cost?

A: At the frontline of PR359 as I know that is about 7,000,000 – 8,000,000vnd/ m².

Q: Oh, is it rather high?

A: It is possible price; you know that, at this location, it is convenient to trade, besides it is in the big transport road, so it must higher than other locations.

Q: At the moment, do you think how much does it cost per square meter to build a house in your local?

A: It depend on the different locations, I don't clear.

Q: How much does the paddy land cost?

A: About is 250,000 – 300,000vnd/ m² depend on the location of paddy field is near the road or not; at the high or low elevation area because the cultivation will effect on the drainage sytem.

Q: Base on the actual price of construction material to building the housing items, how much does it cost for each square-meter?

A: Depend on the structure of house, as I know construction cost is about 5,000,000vnd/ m².

Q: How much is wages for worker per day to building the house?

A: About 200,000 – 300,000vnd.

Q: Do you know the price of construction material?

A: As I know, sand price is 380,000 – 400,000vnd; cement price depend on the type, average 1,500vnd; iron price also depend on type of iron from 10,000 – 13,000vnd/ kg.

Q: What kind of tree do you plant?

A: There are many kind of tree, such as longan, mango, banana, guava, custard-apple, and dracontomelum... and more.

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

A: I don't remember, but not much, these trees are only for family using.

Q: How much does the paddy price cost in this year?

A: About 6,500vnd/ kg.

Q: Thanks alot!

Phạm Văn Giang, An Lư commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: How much does the homestead land cost?

A: I don't know axactly about that. But price of homestead land at An Lao Hamlet is about 2,000,000vnd/ m²; and at commune axe-road is about 3,000,000vnd/ m².

Q: How much does the agricultural land cost?

A: In recent year, there is no agricultural land transaction, but in 2011, there was a Project compensated 70,000,000vnd/ 360m² near the compensation cost of VSIP Project is about 130,000,000vnd/ 360m², is approxiamately 360,000vnd/m². This is the information of other commune I heard.

Q: What kind of tree do you plant?

A: Banana, jackfruit, longan, mango, eucalyptus...

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

Q: Mango is about 600,000vnd/ tree; longan is 800,000vnd/ tree; other fruit is only for family's using; eucalyptus has not harvested yet; banana is 100,000vnd/ tree.

Q: How much does the paddy price cost in this year?

A: Average is 6,500 vnd/ kg.

Q: How much does it cost per square meter to build a house in your local?

A: I don't know.

Q: How much is wages for worker per day to building the house?

A: About 200,000vnd.

Q: How much is wages for worker per day to building the other items?

A: I think it same.

Q: Do you know the price of construction material?

A: I don't know.

Q: Thanks alot!

Trần Thị Nhường, An Lư commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: Yes, my household is impacted.

Q: Is there any agricultural land transactions were carried out in this area?

A: There are a few agricultural land transactions.

Q: How much does the paddy land cost?

A: Price of paddy land is about 200,000-300,000vnd/ m² for each different location.

Q: How is about the paddy price in this year?

A: It is unstable; in this year cost is changed from 5,000 – 7,000vnd/ kg.

Q: How much average price is?

A: Average price is 6,000vnd.

Q: Do you plant the timber tree?

A: No, I don't. I only plant the fruit tree.

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

A: Price of jackfruit is about 400,000 – 500,000vnd/ tree, price of mango is about 800,000vnd/ tree, price of guava is 200,000 – 300,000vnd/ tree... almost fruittrees are for family using. If the harvest is too much, we will buy them in the market.

Q: How much does it cost per square meter to build a house in your local?

A: I don't know axactly. But I think, it is range of 4,000,000 – 5,000,000vnd/ m², and depend on the economical condtion of each household.

Q: Do you know the price for constructing the grave in this commune?

A: Earth grave is about 3,000,000 – 4,000,000vnd/ grave; built grave is about 6,000,000 – 7,000,000vnd/ grave; however it even tills 9,000,000 – 10,000,000vnd/ grave for ability of each different household.

Q: How many is labor price in local area?

A: As I know it is about 200,000 – 300,000vnd, this depends on the job.

Q: How much is wages for worker per day to building the house?

A: Housing construction worker is about 250,000 – 300,000vnd/man-day.

Q: How much is wages for worker per day to building the other items?

A: I don't know.

Q: Do you know the price of construction material such as sand, iron...?

A: I only know the price of sand is 300,000vnd.

Q: Thanks alot!

Phạm Văn Tụ, An Lư commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: No, not impacted.

Q: How much does the homestead land cost?

A: I don't know exactly about that. You should ask another. I don't care about the land transactions.

Q: How much does it cost per square meter to build a house in your local?

A: I don't know.

Q: How much is wages for worker per day to building the house?

A: It is about 200,000vnd.

Q: Do you know the price for a construction man-day to build the other item as gate, breeding facilities?

A: It is the same or cheaper little.

Q: Do you know the price of construction material such as sand, iron...?

A: Sand is about 300,000vnd.

Q: How is about the cement price.

A: It is about 1,500vnd.

Q: Thanks alot!

Lê Văn Hưởng, Thủy Triều commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: There is no land transaction. However the homestead lands price at the frontline of PR359 is about 7,000,000 – 8,000,000vnd/ m².

Q: Is there any agricultural land transactions were carried out in this area?

A: In recent year, there is no land transaction. But in the past, the agricultural land is compensated higher 2 times promulgated compensation price. This compensation price is too low. But nowadays, the promulgated compensation price is compensation higher 5 times, people feel happy and agreement.

Q: How much does it cost per square meter to build a house in your local?

A: In order to build the solid structure house, its price is about 3,500,000 – 4,500,000vnd/ m². However this price depends on the type of house.

Q: What kind of tree do you plant?

A: The fruittree such as: banana, papaya, jackfruit, mango, guava, dracontomelum; the shade trees as eucalyptus...

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

A: Price of banana is about 80,000vnd/ tree, papaya is about 100,000vnd/tree, jackfruit is about 500,000vnd/ tree... almost fruittrees are for family using.

Q: Do you know the price of timber that you planted?

A: As I know price of eucalyptus with the diameter less than 10cm is 50,000vnd/ tree, high tree is about 100,000vnd/ tree.

Q: Thanks alot!

Đỗ Văn Bắc, Thủy Triều commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: Yes, my household is impacted.

Q: Is there any land transactions were carried out in this area?

A: I don't know. If any, maybe happen in the frontline of road area where can trade. In other location, it is a few land transactions, because in recent years, in general, the living is difficult, no one have money to buy land.

Q: How much does the homestead land cost?

A: As I know the homestead lands price at the frontline of PR359 is over 6,500,000vnd/ m². However it depends on the location, some household offered 8,000,000vnd/ m² for long time but no one accepted.

Q: How much does the paddy land cost?

A: It is about 200,000 – 300,000vnd/ m².

Q: Base on the actual price of construction material to building the housing items, how much does it cost for each square-meter?

A: Depend on the structure of house, as I know construction cost is about 4,000,000vnd/ m².

Q: How much is wages for worker per day?

A: It is about 250,000vnd for build the house and 200,000vnd for building other items.

Q: Do you know the price of construction material such as sand, iron...?

A: Sand is about 300,000vnd, cement is 1,600vnd, and iron is about 10,000 to 20,000vnd depends on the type.

Q: Do you plant many kinds of tree?

A: Yes, I do.

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

A: Price of longan is about 1,000,000vnd/ tree; mango is about 800,000vnd/ tree...

Q: How much does the paddy price cost in this year?

A: About 6,500vnd/ kg.

Q: Thanks alot!

Nguyễn Văn Tư, Thủy Triều commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: How much does the homestead land cost?

A: I don't know.

Q: What kind of tree do you plant?

A: Banana, jackfruit, mango, longan, eucalyptus...

Q: Do you estimate the value of your fruit trees that is counted into money in this year?

A: 700,000vnd/ mango tree, 550,000vnd/ longan tree, 500,000vnd/ jackfruit tree, 80,000vnd/ banana tree; and others for family using, eucalyptus has not been harvested yet..

Q: How much does the paddy price cost in this year?

A: Average is 6,500vnd.

Q: How much does it cost per square meter to build a house in your local?

A: I don't know.

Q: How much is wages for worker per day to building the house?

A: It is about 250,000vnd.

Q: How much is wages for worker per day to building the other items?

A: I think the same price.

Q: Do you know the price of construction material such as sand, iron...?

A: I don't know.

Đỗ Văn Biên, Thủy Triều commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: However the homestead lands price at the frontline of PR359 is higher because in the location can trade and lower than locations in hamlet.

Q: Low price is how much?

A: In the frontline of PR359, price is about 7,000,000 – 8,000,000vnd/ m²; in the hamlet price are about 2,500,000 – 3,000,000vnd/ m².

Q: How much does it cost per square meter to build a house in your local?

A: I don't clear much. Depending on the type of house and different materials, price is estimated about 4,000,000 – 5,000,000vnd/ m².

Q: Do you know the price of construction material?

A: The material is the same prices. Table price for material is applied by shops in monthly. Price of sand is 350,000 – 400,000vnd/ m³, iron depends on type and sell in kilogram, or sell in iron-bar. If any shop sells with higher price, there is no buyer.

Q: How much do the furnitural things cost, example is toilet furniture?

A: Price depends on production firm and different quality. Example is the INAX china porcelain lavabor, normal type is about 2,500,000vnd/ set.

Q: Do you think that the promulgated price of Haiphong CPC is suitable with the actual price?

A: I don't care about the promulgated price of Haiphong CPC, because I am agent of Construction material company, so I only use the company's prices. When I glance at the CPC's price I think it rather suitable, but in detail, it is rather difficult to compare.

Q: Thanks alot!

Nguyễn Thị Tới, Trung Hà commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: Yes, my household is impacted.

Q: Is there any land transactions were carried out in this area?

A: I don't know.

Q: How much does the agricultural land cost?

A: There is no transaction. If you want to know detail, you should ask another.

Q: If you need to sell the agricultural land, how much does it cost?

A: I think the same with another commune. It is about 300,000vnd/ m²

Q: Do you plant many kind of tree?

A: Yes, I do.

Q: Which kind of tree?

A: Jackfruit, mango, draconmetalum, guava, lemon...

Q: How much do these trees cost?

A: I don't know.

Q: Do you estimate the value of your fruittrees that is counted into money in this year?

A: Mostly for family's using; 500,000vnd/ jackfruit tree; 200,000vnd/ guava tree; 800,000vnd/ mango tree

Q: How much does it cost per square meter to build a house in your local?

A: I don't know. You should ask the male.

Q: Thanks alot!

Nguyễn Văn Bích, Ngũ Lão commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: There are many land transactions because Ngu Lao commune is one of central commune of Thuy Nguyen Rural District, specially at the PR359 area.

Q: How much does the homestead land cost?

A: As I know the household have just transferred with the price 8,500,000vnd/ m² and they conducted the land transaction contract. This household is in PR359.

Q: If you want to sell the homestead land, how many prices do you want?

A: Same as the sold price in this area.

Q: Means is 8,500,000vnd/ m².

A: Yes, it must be.

Q: How much does the paddy land cost?

A: 200,000 – 300,000vnd/ m².

Q: How much does it cost per square meter to build a house in your local?

A: As I know in order to build the 2 storey-house, the construction cost must be 5,000,000vnd/ m²

Q: How much is wages for worker to building the house?

A: Is about 200,000 – 300,000vnd depend on the type of workers. Price for the construction worker is about 300,000vnd but auxiliary worker is about 200,000vnd/ mand-day.

Q: How much is wages for worker to building the other item is?

A: I don't know. Maybe the wage is the same.

Q: Do you know the price of construction material?

A: Price of cement is 1,400,000vnd/ ton, sand is 380,000vnd/ m³; price of iron depends on the type of iron such as iron Ø 6, Ø 8 is 13,000vnd/ kg.

Q: Do you know the price for constructing the grave in this commune?

A: Each grave have the different prices, price of earth grave is about 3,000,000vnd; and the built grave also depend on the structure of each grave, sample built grave is about 4,000,000vnd but with the fastidious built grave may be the price up to 10,000,000vnd (exclude the price for buying the buried land).

Q: In this year how much does a kilogram of rice cost?

A: 6,500vnd/ kg.

Q: Thanks alot!

Bà Nguyễn Thị Chiên, Ngũ Lão commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: Yes, my household is impacted.

Q: Is there any land transactions were carried out in this area?

A: Agricultural land transaction is not much. But the homestead land is okay.

Q: How much does the homestead land cost?

A: Price for homestead land is 8,000,000vnd/ m² at frontline of PR359; and is 3,000,000 – 3,500,000vnd/ m² at frontline of axe-hamlet road.

Q: How much does the agricultural land cost?

A: I don't know. I am a retired teacher, so I don't care much about that, moreover no one in my neighbourhood sell or buy this land.

Q: How much does it cost per square meter to build a house in your local?

A: I don't clear about that. But I think, price maybe in range 4,000,000 – 5,000,000vnd/ m² and depend on structure of house.

Q: Do you know the price for constructing the grave in this commune?

A: Price of earth grave is about 3,000,000 – 4,000,000vnd; built grave depend on the ability of each household, price is from 6,000,000 – 7,000,000vnd and upto 9,000,000 – 10,000,000vnd.

Q: How much is wages for worker per day to building the house?

A: Is about 250,000 – 300,000vnd/ day

Q: How much is wages for worker per day to building other items?

A: I don't know.

Q: Do you know the price of construction material?

A: I don't know.

Q: Thanks alot!

Lê Thị Hiền, Ngũ Lão commune, Thủy Nguyên Rural District (have just constructed the new house)

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: Homestead land transaction is not much. But the homestead land is okay.

Q: How much does the homestead land cost?

A: I don't sure, it seam 8,000,000vnd.

Q: How much does the paddy land cost?

A: 200,000 – 300,000vnd/ m² for different locations.

Q: How much does it cost per square meter to build a house in your local?

A: Depending on the structure of house, construction price of my house is lum sum 4,000,000vnd/ m². I only observed not only care about other things.

Q: Do you know the price for constructing the grave in this commune?

A: Price of earth grave is about 3,000,000 – 4,000,000vnd; built grave depend on the ability of each household, price is from 6,000,000 – 7,000,000vnd and upto 9,000,000 – 10,000,000vnd.

Q: How much is wages for worker per day?

A: 200,000 – 300,000vnd/ day depend on the work.

Q: Do you know the price of construction material?

A: Price of sand is 380,000vnd/ m³; 1,450,000vnd/ ton of cement; iron Ø 6, Ø 8 is 13,000vnd/ kg; I don't remember prices of others, because they are in the unit price of construction material of shop.

Q: Thanks alot!

Đinh Thị Vĩnh, Ngũ Lão commune, Thủy Nguyên Rural District (owner of construction material shop)

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: I don't care about that.

Q: How much does it cost per square meter to build a house in your local?

A: As I know, in order to building the solid structure house like type of house surrounding here, it must be 3,500,000 – 5,000,000vnd/ m²; even upto 5,500,000 – 6,000,000vnd/ m²; and only is about 3,000,000vnd/ m². Construction price depend on the structure of house.

Q: How much does it cost per square meter to build an auxiliary work?

A: Nowadays, local people build this in the house as the type of modern house in city. The local people here have the living condition is too different with the old days.

Q: How much is wages for worker per day?

A: 200,000 – 300,000vnd/ day depend on the work.

Q: Do you know the price of construction material?

A: We have the different unit prices for each production firms. And they also change depend on the different markets.

Q: Do you think that the promulgated price of Haiphong CPC is suitable with the actual price you are trading?

A: I think it's rather suitable prices. However, there are many kinds of construction materials so it's difficult to correct absolutely as market price.

Q: Thanks alot!

Đình Thị Nhàn, Phả Lễ commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject “Haiphong Trunk Road Construction”?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: At present, there is no land transaction.

Q: How much does the homestead land cost?

A: Price of homestead land depends on the location, at the axe-commune road its price is 2,000,000vnd/m² and if selling the land and house maybe upto 2,500,000 vnd/ m².

Q: How much does it cost per square meter to build a house in your local?

A: I don't know, you should ask another.

Q: Do you know the price for constructing the grave in this commune?

A: Price of earth grave is about 3,000,000 – 4,000,000vnd; built grave depend on the ability of each household, price is from 6,000,000 – 7,000,000vnd and upto 9,000,000 – 10,000,000vnd.

Q: How much is wages for worker per day?

A: 200,000 – 300,000vnd/ day depend on the work.

Q: How much is wages for worker per day to building the house and other items?

A: Wages for worker per day to buiding the house is 250,000 – 300,000vnd/ day.

Q: How much is wages for worker per day to building other items?

A: I don't know.

Q: Do you know the price of construction material?

A: I only know the price of sand is about 300,000vnd; I don't know price of other material.

Q: Thanks alot!

Vũ Thị Ngọt, Lập Lễ commune, Thủy Nguyên Rural District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: There is few of homestead land transaction, price of homestead land at the axe-commune road is about 4,000,000 – 4,500,000vnd/ m²; in hamlet it is only 3,000,000vnd/m².

Q: How much does the agricultural land cost?

A: I think same with other locals, is about 300,000vnd/ m².

Q: Is there the fruit traders come to buy the fruit at the garden?

A: No, never see this.

Q: Do you plant the fruit tree?

A: Yes, I do. These trees almost serve for family using, not trading.

Q: Do you know the price for constructing the grave in this commune?

A: Minimum price is about 3,000,000vnd and maximum price level depends on many things, it's difficult to determine.

Q: How much does it cost per square meter to build a house in your local?

A: Construction price depend on the structure of house, but I think it's rather much money to building a house, maybe 4,000,000 – 5,000,000vnd/ m².

Q: Thanks alot!

Nguyễn Thị Quỳnh Vân, Máy Tơ Ward, Ngô Quyền Urban District

Q: Is your household impacted by the Subproject "Haiphong Trunk Road Construction"?

A: No, not impacted.

Q: Is there any land transactions were carried out in this area?

A: This ward is too large. I don't know about like that.

Q: So is there any land transactions were carried out in Nguyen Trai Road?

A: There is no transaction recent years in Nguyen Trai Roads, because everybody knows the information about the Project long time ago. Example House no.43, Nguyen Trai Road offered for sale for long time.

Q: How many does House no.43 Nguyen Trai Road offer the price?

A: They offer 4,000,000,000vnd for land and house. This is a 2-storey house; area is about 50m².

Q: So it must be 40,000,000vnd/ m².

Y: Yes, that's right.

Q: Is there any success case in land transferred in recent year?

A: Seem the case of house no. 20 Nguyen Trai Road.

Q: How much does transferred price?

A: This case was the mortgage asset, and this household can't ability to pay debt, so Bank auctioned, auction price is 4,400,000,000vnd.

Q: The price includes the house and land, does it?

A: Yes, area of land is 80m²; this is the 3-storye house.

Q: How much does it cost per square meter?

A: I don't know exactly, but it seems including the taxes and constructed cost, so it maybe is 40,000,000vnd/ m².

Q: How much does it cost per square meter to build a house in your local?

A: I don't clear about that, you should ask the construction staff of Ward People Committee. But I think it is about 5,000,000vnd/ m².

Q: Is there any household plant kind of trees in Nguyen Trai Road?

A: No there isn't, perhaps only bonsais in each household, there is no land to plant in this area.

Q: So the shape tree in the pavements is managed by Urban Tree Company.

A: Yes that's right.

Q: Thanks alot!

APPENDIX 4: LAND TRANSACTION CONTRACTS

A8.2 Draft Monitoring Form (Land Acquisition / Involuntary Resettlement)

Name of person in charge and filling this monitoring form: _____

Date of filling this monitoring form: _____

A. Preparation of Resettlement Site

No.	Explanation of the site	Status	Details such as: (1) Site selection process and identification of candidate sites (2) Discussion record with PAPs (3) Development of the site including infrastructure (4) Main reasons for delay (if delayed) (5) Additional information (if any)	Complete Date or Expected Date of Completion
1	Location: Area: Number of Households:		(1) (2) (3) (4) (5)	
2	Location: Area: Number of Households:		(1) (2) (3) (4) (5)	
3	Location: Area: Number of Households:		(1) (2) (3) (4) (5)	
4	Location: Area: Number of Households:		(1) (2) (3) (4) (5)	

B. Public Consultations

No.	Date	Place	Contents of the consultation / main comments and answers
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

*Add lines as necessary.

C. Resettlement Activities

Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organizations
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
Preparation of resettlement									
Approval of RAP									
RAP disclosure on JICA Website									JICA
Approval of policy framework of compensation , assistance and resettlement*									
Disclosure of policy framework of compensation , assistance and resettlement*									
Approval of Investment Policy									
Budget securing for resettlement activities									
Approval of Project Investment Decision									
Land acquisition declaration by HPPC									
Contract with Independent consultant for Replacement Cost Survey		MM							
Contract with External Monitoring Agency		MM							
Establishment of necessary organizations		Number of Organizations							
Income Restoration Program (IRP) preparation									
Detailed Measurement Survey (DMS)		Number of PAPs							
Finalization of PAPs List based on DMS		Number of PAPs							
Submission of Replacement Cost Survey report									
Calculation of									

Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organizations
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
compensation amount to be paid to PAPs									
Approval of plan of compensation , assistance and resettlement									
Disclosure of plan of compensation , assistance and resettlement									
Submission of External monitoring report									
Implementation of resettlement									
Negotiation		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							
Payment of compensation		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							
Provision of land plots		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							
Provision of apartment in resettlement sites		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							

Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organizations
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
Provision of assistance for Vulnerable PAPs		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							
Provision of assistance for Business		Number of affected businesses							
Lot 1 (Nguyen Trai Bridge)		Number of affected businesses							
Lot 2 (Vu Yen Bridge)		Number of affected businesses							
Lot 3 (Ring Road No.3)		Number of affected businesses							
Site clearance		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							
Income Restoration Program (IRP) implementation		Number of PAPs							
Lot 1 (Nguyen Trai Bridge)		Number of PAPs							
Lot 2 (Vu Yen Bridge)		Number of PAPs							
Lot 3 (Ring Road No.3)		Number of PAPs							
Grievance Redress	-	Number of cases							
Lot 1 (Nguyen Trai Bridge)	-	Number of cases							

Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organizations
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
Lot 2 (Vu Yen Bridge)	-	Number of cases							
Lot 3 (Ring Road No.3)	-	Number of cases							

*According to Article 17 of Decree 47/2014/ND-CP, this document should be submitted to MONRE and approved by the Prime Minister.

D. Record of Grievances

No.	Date	Place	Status (Received/On Going/Solved)	Contents of Grievance	Response against Grievance	Responsible organization
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

*Add lines as necessary.

END

Public meeting for Nguyen Trai Bridge project as the candidate project financed by STEP loan



対ベトナム円借款「グエンチャイ橋建設事業」STEP候補案件に係る意見交換会

2016年7月12日(火)
JICA市ヶ谷ビル



ご説明の流れ

- I. ベトナム概況
- II. ベトナム国開発計画と対ベトナム協力方針
- III. ベトナム交通運輸セクターの概況
- IV. グエンチャイ橋建設事業
- V. 質疑応答



説明会スケジュール

13:15-13:30	受付・開場
13:30-13:40	開会挨拶
	JICA東南アジア・大洋州部東南アジア第3課
13:40-14:30	「グエンチャイ橋建設事業」
	案件概要説明 (株)長大、(株)オリエンタルコンサルタンツ、 (株)アルメックVPI
14:30-14:40	閉会挨拶・アンケート回収
	JICA東南アジア・大洋州部東南アジア第3課



ベトナム国概要

正式名称：ベトナム社会主義共和国
(Socialist Republic of Viet Nam)
面積：32.9万平方キロメートル
(日本の約0.88倍、九州を除く面積に相当)
人口：9,250万人(2014年)
※世界第13位、東南アジア第3位
※年平均増加率1.2%(1999-2009年)
首都：ハノイ(693万人、2013年)
主要都市：南部 ホーチミン(781万人、同)
北部 ハイフォン(192万人、同)
中部 ダナン(99万人、同)
南部 カントー(122万人、同)
住民：ベトナム(キン:Kinh)族(約86%)、タイ(Tay)族(1.9%)
ターイ族(They)(1.7%)、ムオン族(Muong)(1.5%)、
クメール系(Khmer)(1.4%)、華人(1.1%)など54の民族
言語：ベトナム語(公用語)
宗教：大衆仏教(約80%)、カトリック、プロテスタント、
ホアハオ教、カオダイ教など
政治体制：社会主義共和制
主要政党：ベトナム共産党一党体制
共産党書記長：グエン・フー・チョン書記長(北部出身)
国家主席(大統領)：チュオン・タン・サン(2011年7月～)
首相：グエン・タン・ズン(南部出身3期目、2006年6月～)
国会：グエン・シン・フン議長、1院制、500議席(定数)、任期5年
内閣：グエン・タン・ズン首を中心とする内閣が2011年8月の第1期
第一回国会で発足、任期5年
国内総生産(GDP)：約1,878億米ドル(2014年名目値、日本の1/30強)
(一人当たりGDP:2,073ドル(2014年))
通貨：ドン(Dong)、1ドル=22,304ドン(2016年2月10日)

主要出来事	
1884年	フランス保護国化
1945年9月	ベトナム民主共和国の独立を宣言
1946年12月	インドシナ戦争勃発
1954年7月	ジュネーブ協定締結(南北分断)
1964年8月	ベトナム戦争勃発
1965年2月	アメリカによる北爆開始
1973年1月	パリ和平協定調印
1975年4月	サイゴン陥落、ベトナム戦争終結
1976年7月	ベトナム社会主義共和国成立(南北統一)
1979年1月	ベトナム軍によるブノムベン攻略
1986年12月	第8回共産党大会でドイモイ政策を採択
1989年9月	ベトナム軍、カンボジアからの撤退を完了
1991年10月	カンボジアとパリ協定締結
1992年	日本の対越援助再開
1994年	アメリカの対越経済制裁解除
1995年7月	ASEAN加盟、米越国交樹立
1998年11月	APEC加盟
2006年4月	第10回共産党大会開催
2006年6月	チェット国家主席、ズン首相就任
2006年11月	ハノイでAPEC総会開催
2007年1月	WTO加盟
2007年5月	総選挙
2010年10月	ハノイでASEAN会合開催
2011年1月	第11回共産党大会開催、チェット新書記長選出
2011年7月	新内閣発足、サン国家主席新任、ズン首相留任
2016年7月	第12回共産党大会開催、チョン書記長留任



ベトナム国概要

- ◆地理的重要性-東西・南部経済回廊の玄関口
- ◆強固な日越経済関係-勤勉な国民性と豊富な労働力
- ◆開発上のニーズと日本の新成長戦略
- ◆絶対に失えない、負けれない市場(インフラシステム輸出戦略)

メコン域内物流(東西回廊・南部経済回廊)とJICA支援



(円) = 円借款事業、(無) = 無償資金協力事業

◆インドシナ半島の東の端に位置し、東西・南部経済回廊の玄関口として物流上の重要拠点。

◆勤勉な国民性と豊富な労働人口により日系製造業の拠点としても人気が高い。

◆生産拠点のみならず、9千万人の人口規模・近年の所得増加により消費市場の成長可能性も高い。サービス業の進出も増加傾向。

◆日本政府の新成長戦略では、インフラシステム輸出の重要国。

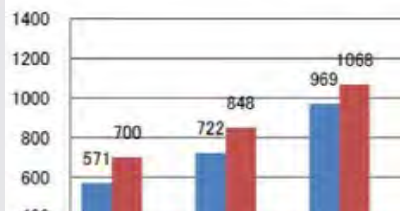
◆2018年のASEAN域内での経済統合、2020年の工業国化に向けて、経済インフラの整備が開発上の最重要分野の一つ。南北高速道路、南北高速鉄道、新国際空港等に代表される大規模インフラの建設が加速。

◆1992年のODA再開以降の強固な日越関係を土台とした戦略的パートナーシップの下、レアース開発、ラックフェン港等の開発において、日本をパートナーとすることを両国首相間で合意。

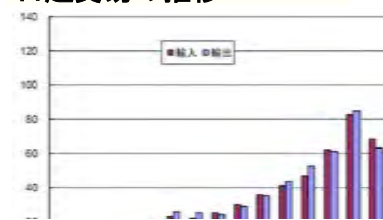
JICA
5

ベトナム国概要

貿易動向(億ドル)



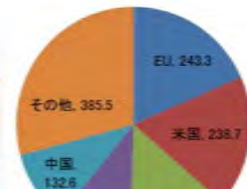
日越貿易の推移



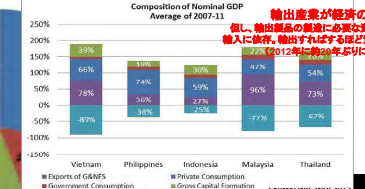
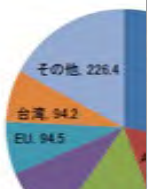
貿易主要品目(2013年)

【輸出】 原油、繊維製品、履物、水産物、電子機器
【輸入】 機械、石油製品、鉄鋼、布等、電子機器

主要輸出先(億ドル)



主要輸入



7



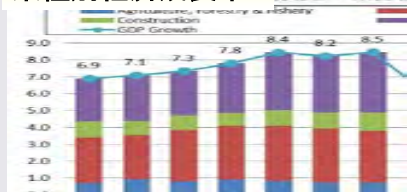
ベトナム国概要

経済成長率



2000年から2010年までの10年間の平均経済成長率7.3%
2013年の実質GDP成長率:5.4%、2014年:5.98%、2015年:6.7%
一人当たりGDP:2,073ドル (2014年、日本:38,221ドル)

業種別経済成長率



人口(2014年)

約9,250万人
総人口の6割強が30歳未満
(日本は約3割が30歳未満)

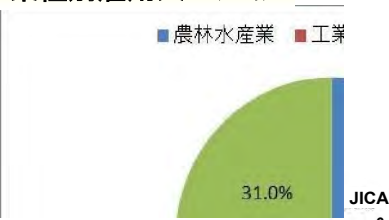
進出日系企業数(2014年)

ハノイ:555社、ホーチミン:679社、ダナン65社

在留邦人数

出所:在越日本大使館
約13,547名(2014年10月現在)

業種別雇用人口(2012年)



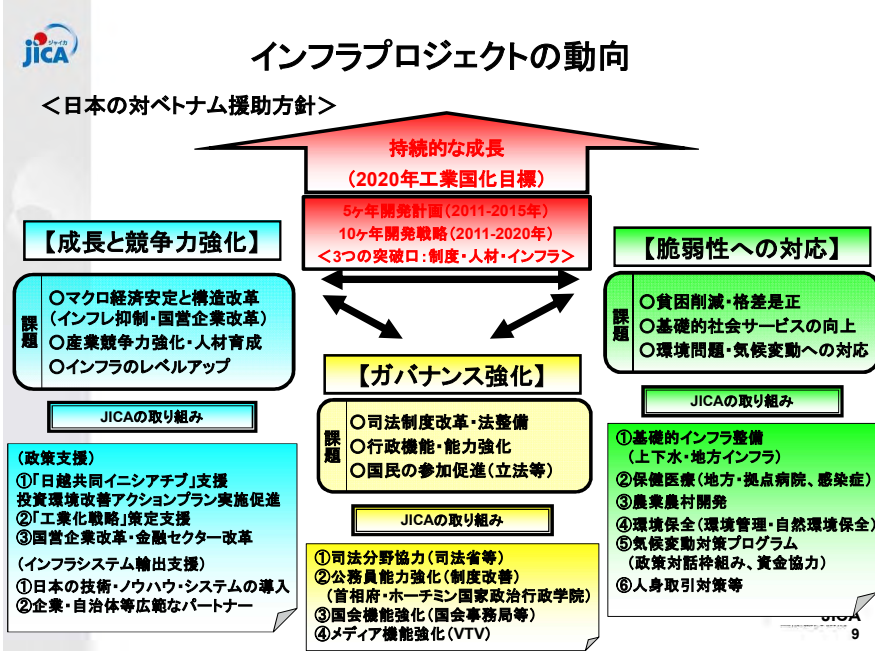
6



ご説明の流れ

- I. ベトナム概況
- II. インフラプロジェクトの動向
- III. ベトナム交通運輸セクターの概況
- IV. グエンチャイ橋建設事業
- V. 質疑応答

8



インフラプロジェクトの動向

<JICAによる協力>

資金協力

資金協力実績 (承諾額) (億円)

年度	有償資金協力 (注)	無償資金協力
2011年度	2,700	35
2012年度	1,750	12
2013年度	1,656	3
2014年度	827	4

注: 円借款契約 (L/A) 額印額 (交換公文 (E/N) 締結額は、2013年度 2,020億円、2014年度 1,124億円)
無償資金協力はJICA実施分実績額

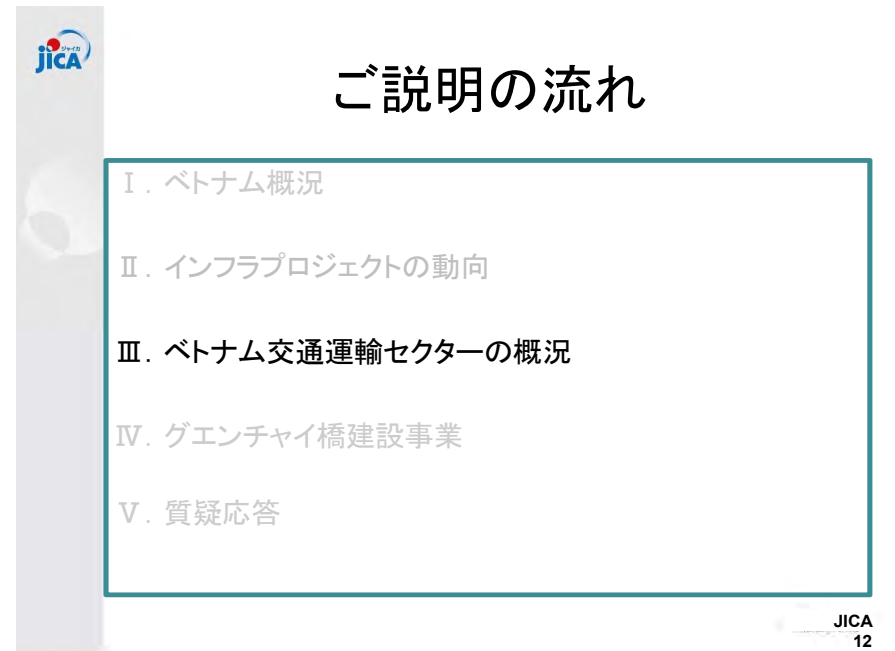
円借款セクター割合
(1992~2014年承諾累計約2.3兆円)

技術協力

専門家派遣実績: 9,629名
(1992~2014年度の累積 コンサルタント含)
派遣先省庁:
計画投資省、交通運輸省、農業省、保健省、環境省、労働省、国家銀行、関税総局、税務総局、ハノイ工科大学・工業大学、司法省等
支援分野:
保健医療、農業開発、植林、金融監督、投資促進、産業人材育成、中小企業振興、環境保全、気候変動対策等
研修員実績: 22,996名
(1992~2014年度の累積)
(日本での研修: 12,300名、国外での研修: 10,696名)

ボランティア事業

ボランティア派遣実績: 534名
(1992~2014年度の累積)
(JOCV 388名 シニアボランティア146名)
支援分野:
保健医療、農村開発、環境保全、産業人材育成、裾野産業、日本語教育等





ベトナム交通運輸セクターの概況

- ◆ 日本のODAで整備した道路の総延長距離は3,309km（現在整備中の道路も含む）。
 - このうち、幹線道路の総延長距離は1,017Km、小規模インフラ事業によって整備した地方道路総延長距離は2,292km。
- ◆ 円借款により一般国道を整備した総延長距離は、現在整備中の道路も含めると650km。
 - ベトナムには舗装され片側二車線という高規格の一般国道の総延長は約900kmと、円借款による高規格の一般国道整備への寄与率は約7割となる。
- ◆ 日本のODAで整備した橋梁の数は、現在整備中の橋も含めて287橋で、うち鉄道橋梁は63橋である。
- ◆ 紅河デルタ地域において幹線道路が整備されて、拠点都市間移動のスピードアップが実現。

JICA



ベトナム交通運輸セクターの概況

- ◆ ハイフォン港は、1990年代初めは航路埋没のため貨物取扱量は250万トン程度であったが、その後、2期にわたる緊急リハビリ事業を経て、2011年の貨物取扱量は1990年の約10倍の2,500万トンに増加。
- ◆ 国道一号線と南北統一鉄道の橋梁リハビリ事業、ハイヴァン・トンネル建設事業を通して、ベトナムの南北国土軸の整備に貢献した。
 - 国道1号線の整備は、世銀とADBが道路リハビリを担当し、日本のODAは橋梁リハビリを担当した。
 - 国道1号線の走行速度は、事業前は30km/時台であったが、事業後には60km/時台に改善した。
- ◆ ハイヴァン・トンネル(6,280km)建設で移動時間が旧道使用時の平均60分から平均15分に短縮。

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ベトナム交通運輸セクターの概況

- ◆ 1993年に「ベトナム北部地域交通システム整備計画調査」を作成。
- ◆ 以後、道路交通については以下の策定を支援。
 - 「運輸交通開発戦略(VITRANSS)」
 - 「持続可能な総合運輸交通開発戦略(VITRANSS II)」
 - 「ホーチミン市都市交通調査」
 - 「ハノイ市都市交通計画」
 - 「道路交通安全マスタープラン」
- ◆ 他のサブセクターでは以下の策定を支援。
 - 「南北縦貫鉄道整備計画」
 - 「ハノイ新空港開発計画」
 - 「全国沿岸海上輸送整備計画」
 - 「南北交通鉄道建設計画」

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◆ 事業概要

グエンチャイ橋(片側2車線、橋梁、アプローチ道路)の建設(国際競争入札)
 コンサルティング・サービス(入札補助、施工監理)
 (ショートリスト方式)

◆ 実施機関

ハイフォン市 交通運輸局(Communication and Transport
 Department of Hai Phong City)

◆ 環境社会配慮

- カテゴリーA案件
- 準備調査のなかでEIA、住民移転計画策定支援し、6月末にベトナム政府に提出済

◆ これまでの進捗・今後のスケジュール

2015年2月 協力準備調査開始(2016年10月末迄)
 2016年2月 Pre ファクトファインディングミッション
 2016年7月 STEP予定候補案件 説明会開催
 2016年8月 ファクトファインディングミッション
 2016年10月 審査
 2017年3月 L/A調印予定(案)

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グエンチャイ橋建設プロジェクト [案件概要説明]

Nguyen Trai Bridge Construction Project



Information only
and may subject to
change

株式会社 長大
株式会社 オリエンタルコンサルタンツグローバル
株式会社 アルメックVPI

2016年7月12日

本日の説明内容

1. 事業背景
2. 事業の概要
3. 事業内容(構造概要、自然条件、交差物件)
4. 本邦技術活用条件STEPの適用予定
5. 事業スケジュール
6. 契約パッケージ案と契約形態
7. 事業実施前提条件

プロジェクト位置図



事業背景 ①ハイフオン市の概要と本事業の意義

ハイフオン市の概要と本事業の必要性

ベトナム国政府は「第9次社会経済開発5カ年計画」でハイフオン市をベトナム北部の成長軸として優先的に開発する方針を示した。現在の中心部はカム川の南側である。工業地区、新都市がカム川の北側に計画され、市の発展が期待されている。

- 人口190万人（2014年）→240万人（2025年）
- 自動車保有は5%、一世帯あたりのバイク保有台数2台となる割合が急激に増加する。（2020年）
- 開発に伴う人口増、車両増により、市内の渋滞悪化、カム川の既存2橋では渡河交通需要を処理しきれなくなる。

グエンチャイ橋の意義

上記課題の緩和のため、ハイフオン市のカム川南側の現在の市街地と、計画中のカム川北側の官庁街を接続する橋梁。

ハイフオン市は、本橋を北側エリアの開発、および、新官庁街の発展のために重要な橋梁であると位置付けている。さらに、カットビ空港とトゥイニュエン区を結ぶ地域間道路の役割が期待されている。

事業背景 ②ハイフオン市の開発計画と本事業の位置付け

ハイフオン市の開発計画の中での本事業の位置付け

「2020年までの道路交通計画（道路交通マスタープラン）、2030年までの同ビジョン」2014年12月、ハイフオン市策定

➤ 道路ネットワーク

Hanoi-Hai Phong 高速道路（一部開通）

Hai Phong-Quan Ninh 高速道路（2017年予定）

市内幹線道路 - 3つの環状道路

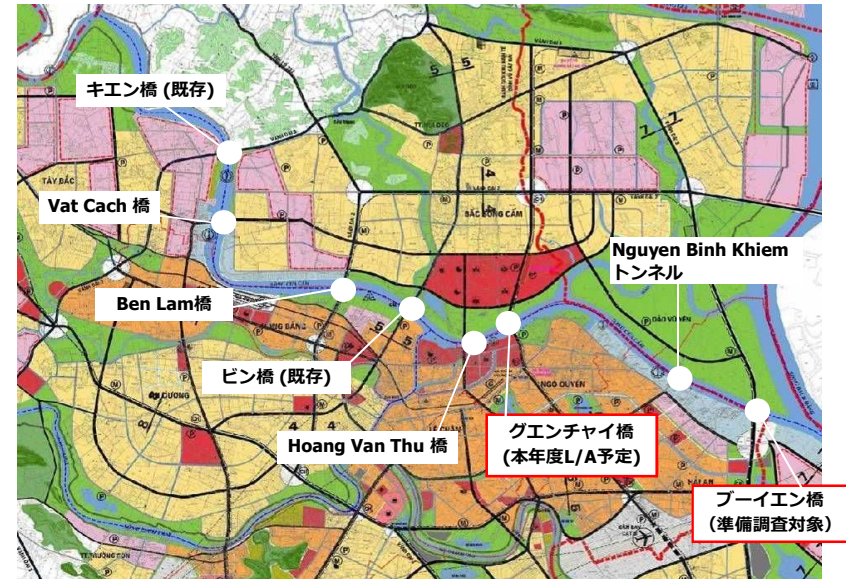
-グエンチャイ橋-カットビ空港-タンブー区間

-東西リンク、など都市内幹線道路の整備

- ✓ ハイフオン市新都市移転計画（Phase I 2016-2020, Phase II 2020-2030）
- ✓ VSIP開発
- ✓ ラックフェン港整備（2017年予定）
- ✓ カットビ空港国際化

3

事業背景 ④カム川を横断する橋梁およびトンネル計画



5

事業背景 ③ハイフオン市の道路ネットワーク計画



	路線延長
第三環状道路 (JICA準備調査実施済)	L=16.8km
ブーイエン橋 (JICA準備調査実施済)	L=3.2km
グエンチャイ橋 (本年度L/A予定)	L=1.81km

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事業背景 ⑤グエンチャイ橋の必要性

- 2020年には、ビン橋（4車線）、キエン橋（2車線）の交通量は交通容量を超過し、渡河交通量进行处理できない可能性がある。2020年までに飽和するビン橋の混雑度を緩和するには、グエンチャイ橋（4車線）を供用するのが望ましい。
- 2030年では交通量増加のため、グエンチャイ橋とブーイエン橋の両方が必要となる。
- グエンチャイ橋、ブーイエン橋プロジェクトは、経済的に極めてフィージブルである。特にグエンチャイ橋プロジェクトのEIRRは34.9%と高く、経済効果が顕著である。

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事業の概要

プロジェクトの範囲

プロジェクト区間	概要
グエンチャイ橋	L=1.81km 主橋梁、インターチェンジおよびアプローチ道路

✓ 事業実施機関：新都市開発PMU



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事業内容 ②橋梁設計条件

航路条件

対象橋梁	グエンチャイ橋
設計船舶	7,000 DWT
設計速度	8 ノット (14.816 km/h)
航路高 (H)	Hmax5% (+2.37m) + 25.0m
航路幅 (B)	80m + 曲線拡幅, および 片側30m安全距離

航空制限

H=100m

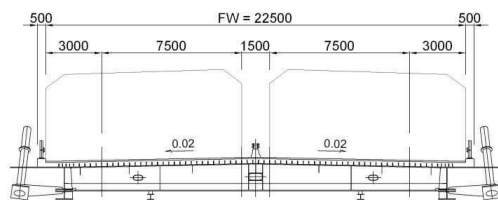
地質条件

架橋位置付近に分布している地質は埋め立て土、第四紀の堆積物とそれより古い堆積物に区分される。

グエンチャイ橋ではN値が50以上の洪積砂質土層を支持層とする。この層の上面深度は-39mから-45mである。

事業内容 ①道路幅員

道路基準 (TCXDVN 104-2007)

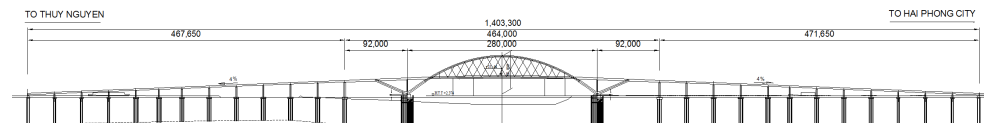


橋梁部の幅員構成

適用地域	都市部
設計基準	TCXDVN 104-2007
道路等級	大都市部第1種都市幹線道路
道路種別	幹線道路
設計速度	80km/h

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事業内容 ③橋梁計画



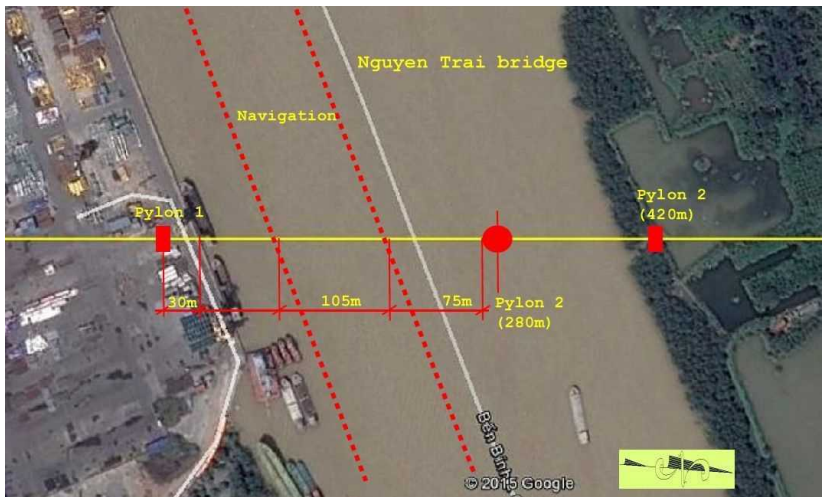
グエンチャイ橋とアプローチ橋梁

橋梁名	橋長(m)	幅員(m)	橋梁形式
北側アプローチ橋	39.65+3@40+2@34+6@40=467.65m	22.5m	Super T
グエンチャイ橋	92+280+92=464.0m	22.5m	アーチ橋
南側アプローチ橋	4@40+32+6@40+39.65=471.65m	22.5m	Super T

グエンチャイ南インターチェンジの橋梁

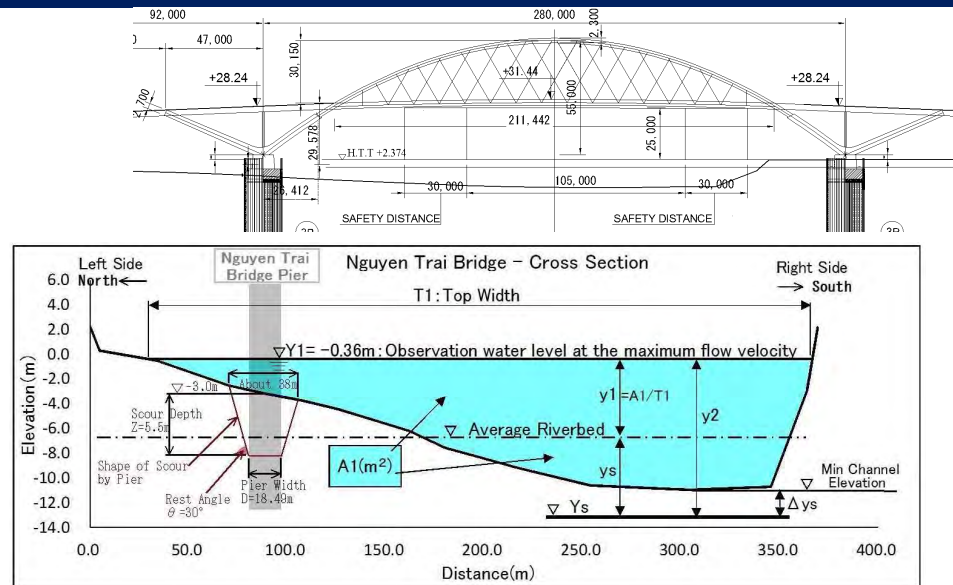
ランプ	橋長(m)	幅員(m)	車線種別	最小半径	橋梁形式
A	14@29=206.0m	7	加速車線	R=60	ホロースラブ
B	8@30=240.0m	7	減速車線	R=60	ホロースラブ

事業内容 ④グエンチャイ橋の橋脚位置



中央支間超を420mとした場合には 25million USD高くなる。
航路局の合意により、中央支間280mを選定した。

事業内容 ⑥グエンチャイ橋の橋脚位置と河川水深

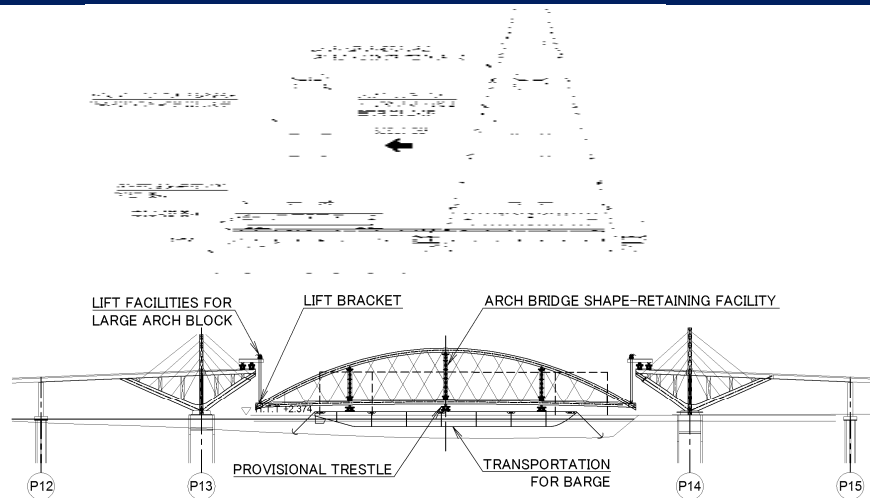


事業内容 ⑤グエンチャイ橋の橋梁形式

斜張橋案		経済性	工事費 1.00	◎
		技術の革新性	ベトナムには多くの斜張橋があり、斬新さはない。側径間の幅幅はベトナム初である。	△
		景観性	主塔の形状により景観性が高められる。カム川には斜張橋が多く、シンボル性は低い。	○
		拡張への対応	側径間の幅幅は可能である。	○
		工期	工期は約40ヶ月	○
自定义吊橋案		航路への影響	航路条件を満たしており問題ない。	◎
		総合評価	AHPによる総合評価値点 0.347	◎
		経済性	工事費 1.41	△
		技術の革新性	東南アジアで最長の吊橋となる。ベトナムで初の自定义吊橋である。	◎
		景観性	曲線ケーブルにより魅力的な景観となる。	◎
アーチ橋案		拡張への対応	側径間の幅幅は容易ではない。	△
		工期	工期は約40ヶ月。航路の開閉期間が長期となる。	×
		航路への影響	航路条件を満たしており問題ない。	◎
		総合評価	AHPによる総合評価値点 0.240	△
		経済性	工事費 1.15	○
	技術の革新性	東南アジアで最長のアーチ橋となる。ベトナムで初のバランスドアーチ橋である。	◎	
	景観性	アーチ曲線により優美な景観となる。カム川の他の橋梁と類似せずシンボル性が高い。	◎	
	拡張への対応	側径間の幅幅は、3案中最も対応しやすい。	◎	
	工期	工期は約34ヶ月。大ブロック架設により短縮できる。	◎	
	航路への影響	航路条件を満たしており問題ない。他の案に比べると橋脚付近が低い。	○	
	総合評価	AHPによる総合評価値点 0.413	◎	

- 斜張橋とアーチ橋が適用可能である。
- ハイフォン市よりアーチ橋のシンボル性の高さが圧倒的に好まれる。

事業内容 ⑦グエンチャイ橋の架設(案)

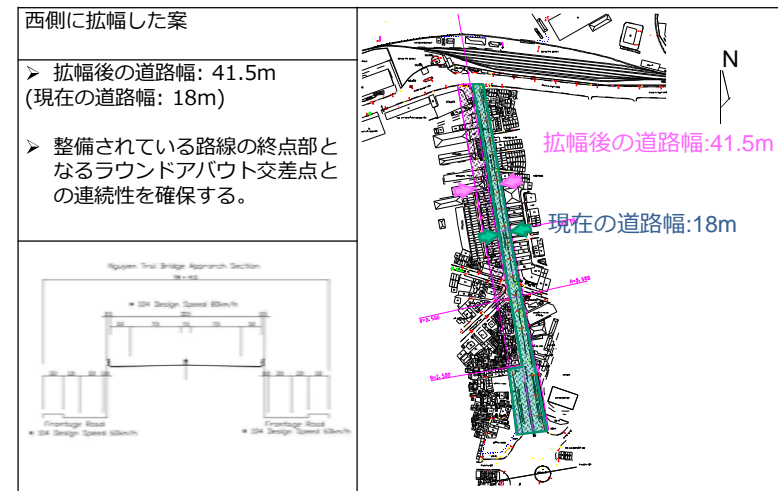


準備調査では、工期の短縮、航路の閉塞期間を最小とするために、大ブロック架設の適用を想定した。大ブロック重量は約3100tonである。橋脚に作用する水平力のバランス、および、経済性から複合構造とする。

事業内容 グエンチャイ橋(イメージ)

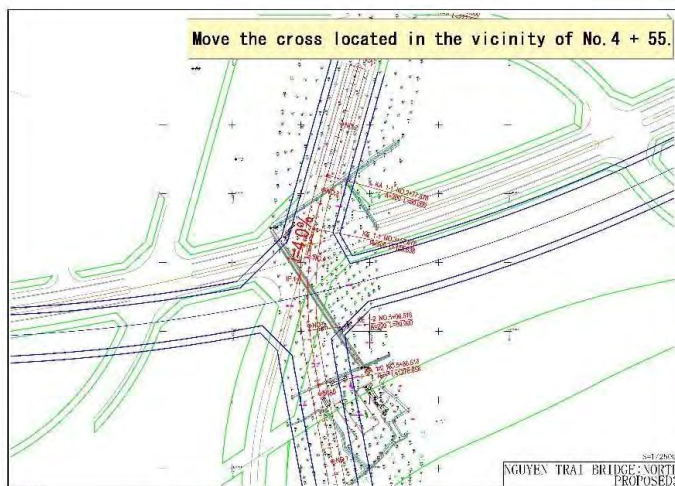


事業内容 ⑨グエンチャイ通りの拡幅計画



グエンチャイ通りには非常に多くの民家が建っている。道路線形と道路幅は住民移転が最小となるよう計画する。

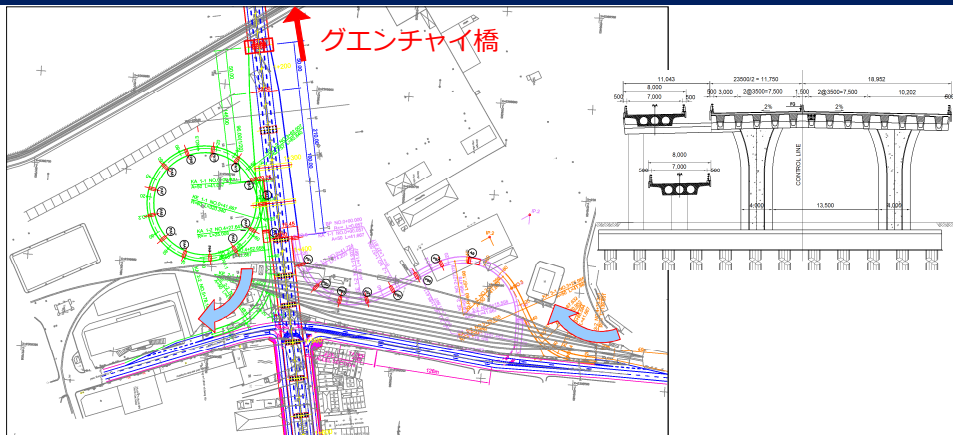
事業内容 ⑧グエンチャイ橋北側アプローチ部の交差道路



VSIPの南側の東西道路は、グエンチャイ橋の北側アプローチ道路を優先し、アプローチ橋の下を通過する。



事業内容 ⑩グエンチャイ橋南インターチェンジ



グエンチャイ橋南側に、レタントン通りに接続する2つのランプ橋を持つインターチェンジを計画する。東側からのONランプ、西側へのOFFランプは分合流方式の接続とする。橋脚位置については、港湾施設の計画を踏まえ、詳細設計段階で見直しの可能性がある。

本邦技術活用案件(STEP)の適用予定

STEPローンの優位性

STEPでは、低い金利が適用できる利点がある。一般ODAと比較して工事への投資額についての優位性は、STEPではない場合に、積算の日本ポーションの部分が一定の割合だけ安い代替品に置き換わるとして、STEPの優位がなくなるのは代替品が平均約19.9%安いときと試算される。本プロジェクトではハイフォン市からの要請により、STEPローンの適用が期待されている。本邦企業から提供される建設機材、材料、技術者の費用比率は、STEPの適用要件30%を超える。以下のような項目が本邦技術として期待される。

- ✓ 構造用鋼材、鋼管杭
- ✓ 吊りケーブル
- ✓ PCケーブル
- ✓ 大ブロック架設の架設技術
- ✓ 舗装材料（接着層）など

ハイフォン市内は、港湾施設を起点とする重車両の走行が多い。市内のキエン橋では舗装の損傷が報告されており、舗装の損傷対策に留意する必要がある。

事業スケジュール(案)

プロジェクト実施スケジュール(案)

実施項目	2017			2018			2019			2020								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
借款契約			▼															
コンサルタント選定	■																	
詳細設計(12ヶ月)							■											
入札準備(15ヶ月)									■									
工事契約																		▼
グエンチャイ橋建設(34ヶ月)																		■

- 2017年3月借款契約予定
- グエンチャイ橋の着工は2019年末が期待される。
- グエンチャイ橋の建設期間は34ヶ月を想定する。

契約パッケージ案

契約パッケージ(案)

パッケージ案	概要
Package 1 グエンチャイ橋	本線延長 L=1.81km 主橋梁、インターチェンジおよびアプローチ道路

調達方式

- ✓ 国際入札 本邦技術活用案件(STEP)適用予定
No.43/2013/QH13, Article 15 International biddingに基づく。

事業実施の前提条件 ①ハイフォン港

ハイフォン港の移転、および、縮小計画

- 1) 本プロジェクトに先立ってハイフォン市によって計画されているハイフォン港の移設、縮小は本プロジェクト実施の前提条件である。ハイフォン市は移転代替地や港湾施設の移転補償を含む移転計画を策定中である。

ご静聴ありがとうございました



事業実施の前提条件 ②用地取得・住民移転

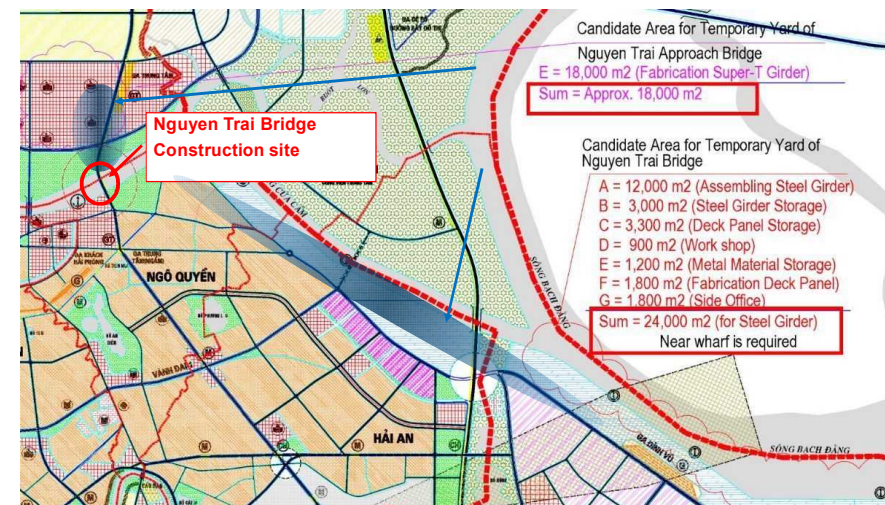
ハイフォン港以外の用地取得

- 1) グエンチャイ橋北側はVSIP工業団地の事業者が本事業に先行して用地取得の実施段階に入っている。VSIP内の道路計画は、本プロジェクトの北側アプローチ道路が優先される。
- 2) 南側取り付け道路の線形は、被影響家屋が最小化されるように検討した。被影響住民への補償、支援、移転は住民移転計画に基づき、ハイフォン市により適切な時期に実施される必要がある。

カム川北岸の堤防建設

- 1) カム川北岸はハイフォン市により新たな堤防建設が予定されている。VSIPの造成、取り付け道路の整備は堤防建設を前提としており、VSIPの造成を前提とする北側アプローチ道路の建設の前提条件となる。

事業内容(参考資料) 工所用ヤード



Appendix 11 NOTICE OF IMPLEMENTATION OF THE PROJECT

11.1 Notes on the implementation of the project in Vietnam

When implementing the project as a yen loan project, the points of concern which have a direct influence on the implementation are presented below.

11.1.1 Procurement circumstances in Vietnam

(1) General information on construction tenders and contracts in Vietnam

1) Bidding method of the Contractor

According to the Law on Bidding No. 43/2013/QH13 (Article 15 International bidding) specifies the required conditions for implementing international bidding as follows:

- The donor of procurement requests international bidding;
- Procurement of goods where the goods cannot yet be manufactured domestically or where they can be manufactured but fail to meet technical, quality or price requirements. International bidding is not organized for common goods already being imported and offered for sale in Vietnam;
- Procurement of advisory services, non-advisory services, construction and installation, and the provision of mixtures for which domestic bidders are unable to satisfy procurement performance requirements.

After considering which bidding mode, international or local bidding, will be selected, the bidding organization will be set up:

- In case of local bidding: The law applied to implementation of the bidding must comply with Vietnamese laws;
- In case of international bidding: The detailed design step is implemented with technical support from JICA and the rules applied to bidding are in accordance with those of the corresponding funding organizations such as ADB, WB or JICA (Article 3 Application of law on bidding, international treaties and international agreements). The government providing the loan will determine the procurement conditions of ODA loans on a case-by-case basis for one of the following 2 main categories: Tied Aid and Untied Aid.
 - Tied Aid: The countries eligible for procurement under the loan are only Japan or both Japan and the recipient country;
 - Untied Aid: The borrower may procure goods and services from all countries and areas.

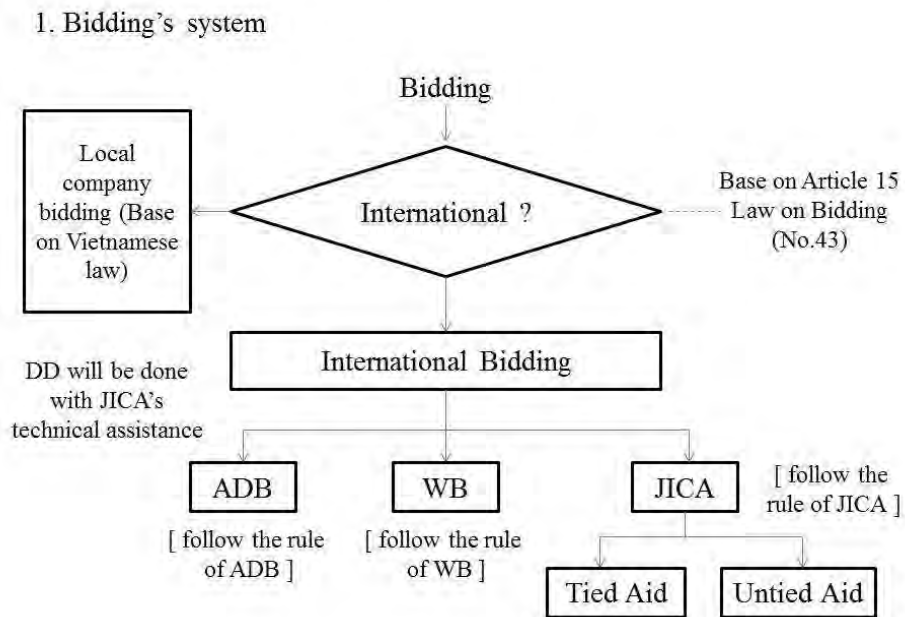


Figure 11.1-1 Bidding system of international bidding

If there are any problems at the bidding stage, for example if the process results in single bidding, there are two cases of single biddings as shown below:

- Special case: direct appointment (1);
- Bidding with only one contractor (2).

In the case of single bidding, the PMU will report to MOT and JICA and ask for approval to use only one contractor for bidding.

The table below represents two actual cases of single bidding for Nhat Tan Bridge and Lach Huyen Port:

Table 11.1-1 Examples of single bidding

Project name	Number of cases
1. Nhat Tan Bridge, Package 3	(1)
2. Lach Huyen Port	(1)

2) Contract conditions of the Contractor

The conditions for selecting international bidding contractors are determined by the law of corresponding countries and organizations:

- In case of local bidding, the Vietnamese Law on bidding No. 43/2013/QH13 dated 26 June 2013 (Article 3 Application of Law on bidding, international treaties and international agreements) shall be applied;
- In case of international bidding under JICA ODA: Sample bidding documents under Japanese ODA loans;

- In case of international bidding under WB or ADB loans, FIDIC: Standard Bidding Documents for Procurement of Works (SBDW) dated June 1995 and June 1996 shall be applied.

3) Contractors in Vietnam

Contractors for international construction projects are selected through international bidding. This bidding method involves selecting the contractor through a PQ process and evaluating the quality which is suitable for the work.

For local contractors, quality is controlled by a ranking list of Vietnamese contractors;

At the construction stage, local contractors are evaluated and approved by SV and PMU. The quality of work is inspected with technical specifications for the project and construction specifications used in Vietnam such as 22TCN-272-05.

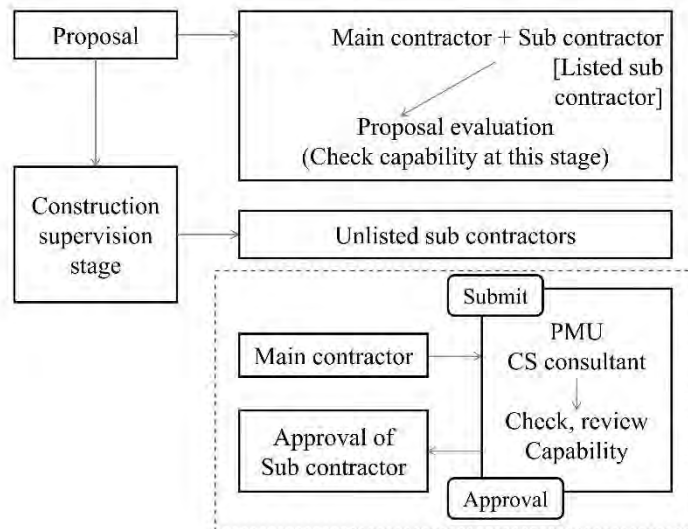


Figure 11.1-2 Selection of subcontractors

The subcontractor selection method is shown in Figure 11.1-2. Quality is evaluated by MOT every year, and the current rankings are shown in Table 11.1-2 for reference.

Table 11.1-2 List of Vietnamese contractors ranked by the Ministry of Transport (in 2015)

No.	Contractor's code	Name of contractor	Ranking	Number of completed packages
Company				
1	100104274	Civil Engineering Construction Corporation No.1 (Cienco 1)	Satisfied	31
2	2900324850	Civil Engineering Construction Corporation No.4 (Cienco 4)	Satisfied	23
3	100105020	Thang Long Construction Corporation	Satisfied	18
4	1000139243	Quyét Tien Construction and Investment Company	Satisfied	17
5	100108663	Thanh An Company	Satisfied	16
6	100512273	Truong Son Construction Company	Satisfied	15
7	100108247	Civil Engineering Construction Corporation No.8 (Cienco 8)	Satisfied	15
8	100108984	Head of Company 319 - Ministry of National Defense	Satisfied	6
9	100105616	Viet Nam Construction and Import-Export Joint Stock Corporation (VINACONEX)	Satisfied	6
10	400101919	Civil Engineering Construction Corporation No.5 (Cienco 5)	Satisfied	4
11	105454762	Head of Company 36	Satisfied	2
12	100107613	Head of Company 789	Satisfied	2
13	2800220625	Urban Investment and Development Company	Satisfied	2
14	100109441	Viet Nam Investment Construction and Trading Joint Stock Corporation	Satisfied	2
15	100726116	Airway Construction Company ACC	Satisfied	2

Source: <http://cucqlxd.gov.vn/xep-hang-nha-thau-xay-lap/2014>

(2) Recommended selection method for the Contractor

1) LCB (Local Competitive Bidding)

This project requires advanced technology for the design and construction method of Nguyen Trai Bridge and Vu Yen Bridge, and international bidding must therefore be applied.

For the embankment section of Ring Road No.3, it is desirable to apply the same bidding method to ensure consistent construction quality and the opening of the highway for traffic at the same time with Vu Yen Bridge. However, on previous projects in Vietnam, the local

contractor bidding system was applied in accordance with the law on bidding.

Bidding method used for Can Tho Bridge is shown in Figure 11.1-3. Local contractor bidding based on the law on bidding was applied for Package 3. There tend to be delays in the schedule in case local contractors are selected.

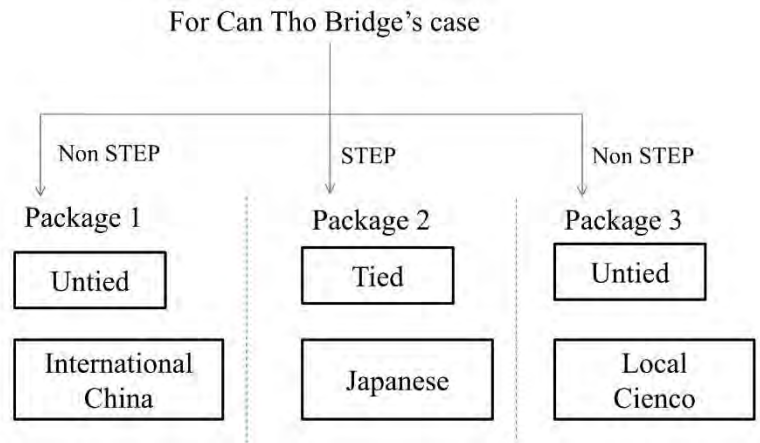


Figure 11.1-3 Bidding system used for Can Tho Bridge

2) Division of construction packages

The procurement of construction work shall be divided into three packages as detailed in Chapter 10 in consideration of the construction constraints, construction schedule, and attractiveness for tenderers.

The division of construction packages is as follows:

Package 1: Nguyen Trai Bridge including main and approach bridges, and road construction

Package 2: Vu Yen Bridge including main and approach bridges

Package 3: The whole of Ring Road 3

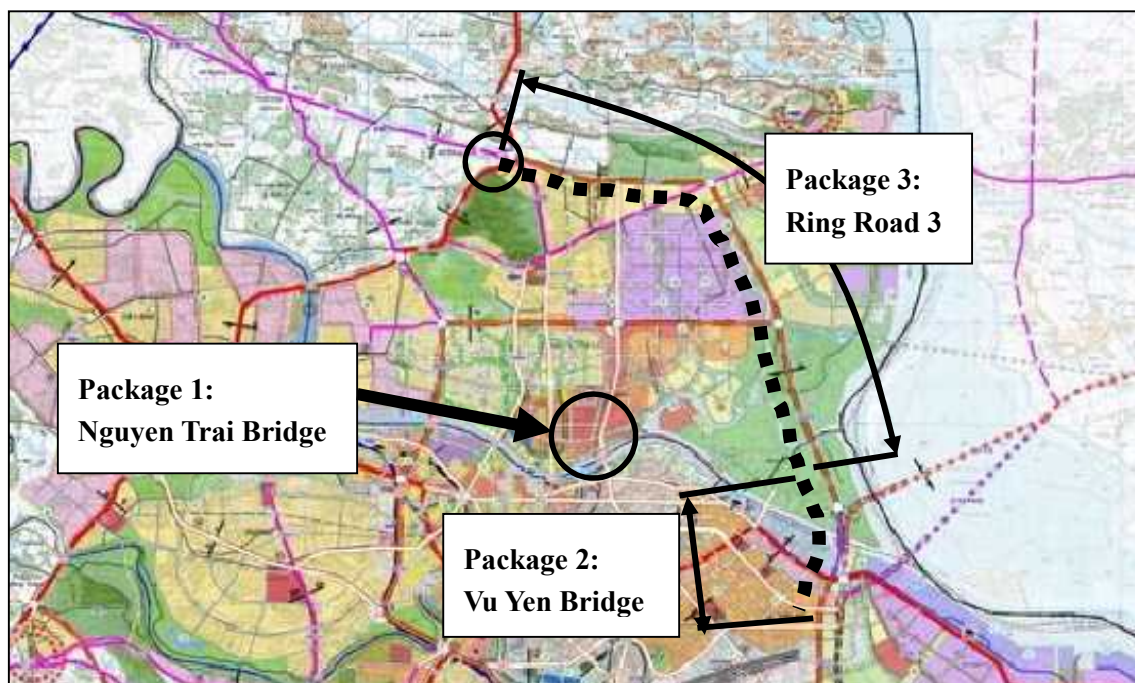


Figure 11.11-4 Schematic plan view of Option A

(3) General information on local consultant tenders and contracts

1) Bidding method of the Consultant

This project requires advanced technology for the design and construction method of Nguyen Trai Bridge and Vu Yen Bridge. International bidding must be used in accordance with JICA guidelines. The procedure applied in Vietnam as shown in Figure 11.1.5 is similar to that in the JICA guidelines. The column inside the dashed line rectangle shows the one phase method with 2 dossier bags which is applied for Vu Yen Bridge.

The table below shows a ranking list of consultants made by the Ministry of Transport.

Table 11.1-3 List of Vietnamese consultants ranked by the Ministry of Transport

No.	Name of consultant	Score
I. Highway sector		
1	Transport Engineering Design Inc. (TEDI)	3325
2	Transport Engineering Design Joint Stock Incorporated South (TEDI SOUTH)	2370
3	Highway Engineering Consultant Joint Stock Company (HECO-TEDI)	2229
4	Large Bridge and Tunnel Consultant and Design Company (BRITEC-TEDI)	2191

5	Transport Engineering Consultant Joint Stock Company No.2 (TECCO2-TEDI)	1920
II. Railway sector		
1	Transport Investment & Construction Consultant Joint Stock Company (TRICC)	1661
2	Transport Engineering Design Inc. (TEDI)	1129
3	Transport Engineering Design Joint Stock Incorporated South (TEDI SOUTH)	697
III. Inland waterway sector		
1	Port-Coast Consultant Corporation	2327
2	Marine Construction Consultant Company (CMB)	2169
3	Port-Seaway Construction Consultant Joint Stock Company (TEDI)	1226
III. Airway sector		
1	Airport Design and Construction Consultancy One Member Limited Liability Company (ADCC)	2690
2	Airway Construction and Service Consultant Joint Stock Company	908
3	Institute of Transport Science and Technology	353

Source:

<http://www.mt.gov.vn/vn/tin-tuc/36473/cong-bo-xep-hang-nang-luc-cac-to-chuc-tu-van-nganh-gtvt-nam-2014.aspx>

Articles and provisions specified below is from Decree 63/2014 ND-CP dated 16/06/2014 "Detailing the implementation of several provisions of the law on bidding regarding the selection of contractors"

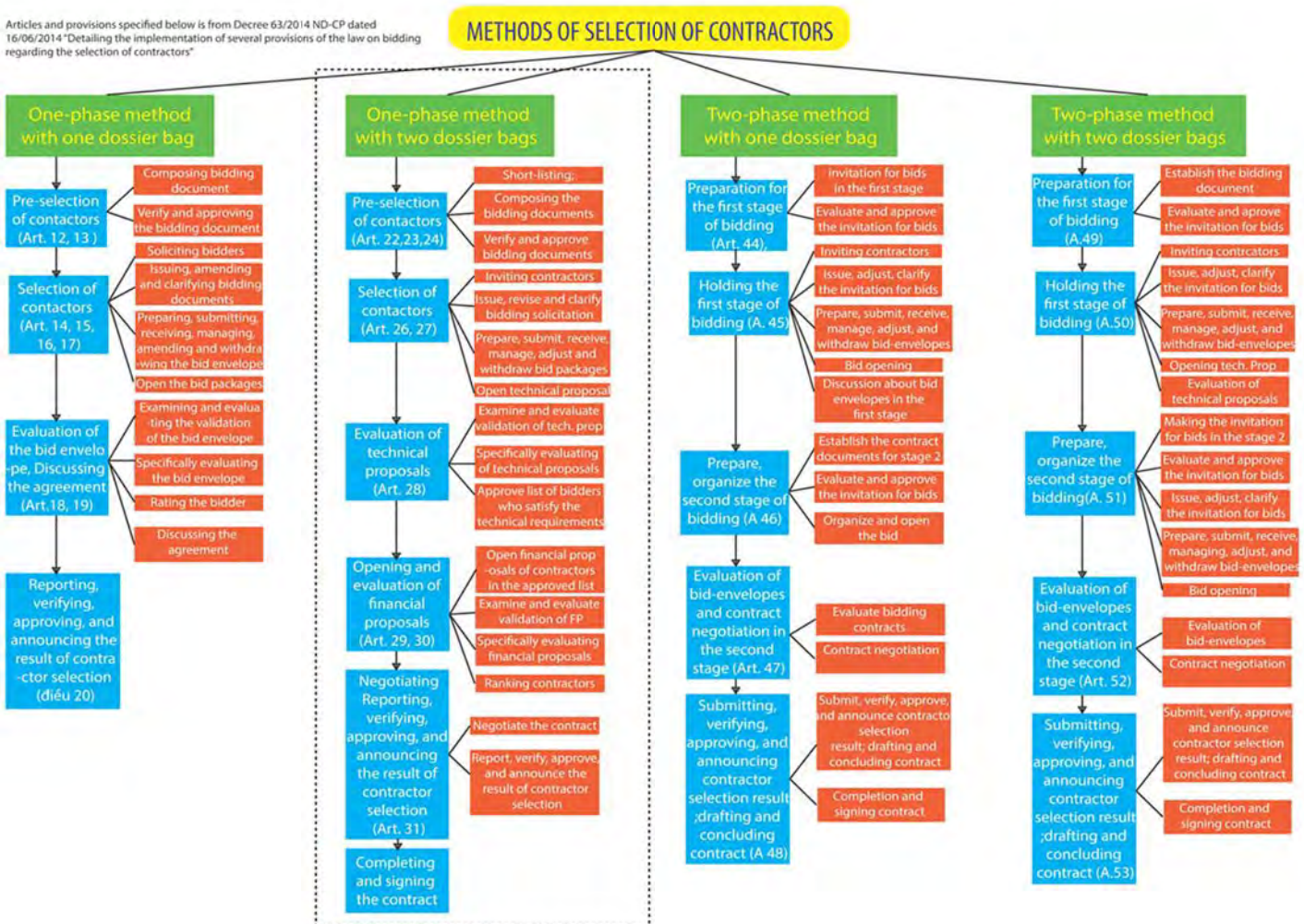


Figure 11.1-5 Selection method for consultants

11.2 Sample PQ conditions for the Contractor of the project

This project requires advanced technology for the design and construction method of Nguyen Trai Bridge and Vu Yen Bridge and international bidding should therefore be applied. Some sample PQ conditions are shown below.

(Sample) General Experience:

The Applicant shall meet the following minimum criteria:

- (a) average annual turnover (defined as billing for works in progress and completed) over the last five (5) years of Japanese Yen 100 billion (Form (3)); and
- (b) successful experience as a prime contractor in the execution of at least three (3) cable-stayed bridge projects, with a minimum main span length of 250m, completed within the last ten (10) years (Form (4)).
- (c) successful experience as a prime contractor in the execution of at least five (5) out of six (6) of the following types of works completed within the last ten (10) years:
 - i) construction of steel girder bridge superstructures with a length of 500m or more and a longest span length of 80m or more,
 - ii) construction of pre-stressed concrete girder bridge superstructures with the length of 300m or more and a longest span length of 80m or more,
 - iii) construction of steel pipe sheet pile foundations with a steel pipe diameter of 1.0m or more, or construction of cast-in-place bored pile foundations with a diameter of 1.2m or more,
 - iv) construction of concrete pylons or piers with a height of 70m or more,
 - v) fabrication of steel bridge structures in the Applicant's own factory with a steel weight of 2,000 tons or more in one contract,
 - vi) construction of a bridge project in Vietnam.

A copy of the certificate of the completed contract issued and signed by the Employer shall be attached for each past project. Certificates written in other languages shall be accompanied by English translations. (One (1) copy in the Vietnamese language is encouraged.)

11.3 Draft ToR for the Project

Draft of Terms of Reference (ToR)

Terms of Reference for Design and Supervision Consultant for the Works under Hai Phong Arterial Road Construction Project

Chapter 1. Background

1. Introduction

The Government of Vietnam has received a loan from the Japan International Cooperation Agency (hereinafter referred to as "JICA") to finance the Hai Phong Arterial Road Construction Project (hereinafter called "the Project") which is to improve transportation capacity and develop efficient logistic network in Hai Phong City, by constructing ring road and new bridges to cross Cam River.

This Terms of Reference (ToR) describes the scope of consulting services for Detailed Design, Tender Assistance, Construction Supervision, Environmental Management, and Technology Transfer to be provided to the executing agency under Hai Phong Peoples Committee for the Project.

2. Project Information

2.1. Background

The Government of Vietnam has prepared the "Socio-Economic Development Plan: SEDP 2011-2015" for rapid and sustainable development of the country. According to the plan, the Government of Vietnam has put high priority on the development of Hai Phong City. Hai Phong City also has developed the plan for Lach Huyen port, an international port on the growth axis in the northern Vietnam expected to open in 2017.

Based on the "Amendment of Hai Phong Construction Master Plan to 2025 and Vision to 2050, September 2009", Hai Phong City has planned to redevelop the existing city area and develop new residential areas and industrial complexes on the northern side of the Cam River. Due to the large scale of the development plans, severe traffic congestion in the city is expected to increase in the near future. There are currently two bridges crossing the Cam River; however it is predicted that the bridges may not have enough capacity to cope with increasing future traffic. Therefore, improvement of the ring road and construction of new facilities to cross Cam River are possible solutions for this issue.

2.2. Objectives of the Project

■ The Project comprises of the following components:

(1) Nguyen Trai Bridge Construction

Nguyen Trai Bridge, a balanced arch bridge, which connects the current administrative center on the south side of the Cam River and the planned administrative center on the northern side of the river in Hai Phong City.

- Number of lane: 4 lanes, each 3.75m wide.

- Span arrangement: $L = 92 + 280 + 92 = 464$ m.
- Approach bridge (north and south): Super T girder
- Nguyen Trai South Interchange (ramp bridge) : Hollow slab girder

The Government of Vietnam intends to use part of the proceeds of the loan for eligible payments for consulting services for which this ToR is issued.

- The Project is expected to be completed by 2022.
- Location of the Project: Hai Phong City
- Executing Agency: Project Management of Urban Development Construction (PMUDC)
- Technical Information: available relevant basic data and studies, technical standard or specifications to be used, etc.

3. Related Projects

- (1) Road Transport Master Plan for Hai Phong City up to 2020, Vision for 2030 (planned)
- (2) Hanoi-Hai Phong Expressway (under construction)
- (3) Ninh Binh-Hai Phong-Quang Ninh Expressway (planned as a BOT scheme)
- (4) Dinh Vu-Cat Hai Economic Zone Road Master Plan (planned)
- (5) Vietnam Singapore Township Industrial and Service Park (VSIP) Hai Phong (under construction)
- (6) Vu Yen Island Construction Project (planned)
- (7) New Urban Area Development Project, *Hoang Van Thu Project* (planned)

Chapter 2. Objectives of Consulting Services

The consulting services shall be provided by an international consulting firm (hereinafter referred to as "the Consultant") in compliance with Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012. The objective of the consulting services is to achieve the efficient and proper preparation and implementation of the Project through the following works:

1. Detailed Design (D/D)
 - (a) Review F/S and relevant existing reports
 - (b) Investigate and carry out survey for topography, geology, hydrology and etc.
 - (c) Prepare deliverables of detailed design (including drawings)
 - (d) Cost estimates based on detailed design.
2. Tender Assistance (T/A)
 - (e) Prepare prequalification (P/Q) document and bidding document
 - (f) Tender assistance to PMUDC for the Contractor selection, regarding bid evaluation, contract award, contract negotiation, and contract documentation.
3. Construction Supervision (C/S)
 - (g) Construction supervision works
 - (h) Assist in construction completion and taking-over certification
 - (i) Defect liability service
4. Facilitation of Implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Resettlement Action Plan (RAP)
 - (j) Review Environmental Impact Assessment (EIA) Report
 - (k) Update and document EIA Report, EMP, EMoP, RAP and other relevant considerations
 - (l) Assist relevant government agencies and NGOs in undertaking social assessment
 - (m) Assist PMUDC in establishing Grievance Redress Committee
5. Technology Transfer
 - (n) Develop and organize capacity building program
 - (o) Carry out on the job training and teach project-based multidisciplinary approach

Chapter 3. Scope of Consulting Services

1. Detailed Design (D/D)

The Consultant shall:

- (a) Review and verify all available primary and secondary data collected during the JICA's preparatory survey for the Project;
 - Investigate and collect the data for cost estimates
 - Investigate and collect planning data related to the project and work with relevant local authorities
 - Collect project documents and design documents of the relevant projects under implementation
 - Work and agree in writing with the local agencies and the authorities

- (b) Carry out all the required engineering surveys and investigations such as below, as applicable to the concerned project components. The consultant is required to study survey data in F/S stage to arrange the survey, avoiding to quantity overlapping;
 - Topographical Survey
 - Horizontal network of controls; H=1/500, National Coordinate System VN2000, using center meridian of Hai Phong
 - Leveling network
 - Secondary control point
 - Reflection of site planning and intersection points with the other works
 - Detailed stakeout works
 - Positioning and leveling of the soil investigation point
 - Hydrological Survey
 - Collection of meteorological and hydrographical data
 - Collect relevant documents and work of the relevant authorities
 - Survey water level
 - Survey situation of existing drainage works
 - Survey fully existing drainage, utility purposes and managing agencies of irrigation systems along and through the route
 - Hydrographic survey of bridges
 - Hydraulic and hydrographic calculation
 - Geotechnical Survey

- Normal foundations and culverts with one hole per 1km
 - Soft ground with two holes per 75m for two sides
 - Each abutment and bridge pier with one drilled hole
 - Material Availability Survey
 - Back filling materials (soil and sand quarries) and sand for soft ground treatment
 - Survey and evaluation of general situation, capacity and transportation length of the routes for exploitation and transportation to the construction site
 - Stone quarry, sand for construction of bridge and culverts, pavement
 - Existing Structural Survey
 - Old bridges and culverts on the cross lines
 - Current situations of irrigation works
 - Underground structures, public works
 - Existing power supply
 - Cultural buildings, temples, pagodas, and relevant legal religious buildings
- (c) Prepare detailed work plan, progress reports and implementation schedule for the Project to ensure effective monitoring and timely project outputs, and regularly update the same.
- (d) Prepare the detailed design of the Project in sufficient detail to ensure clarity and understanding by the Project Management of Urban Development Construction (PMUDC), contractors and other relevant stakeholders. All the design should be in conformity with the Vietnam Standards, or with the appropriate international standards. The detailed design will, as a minimum, include construction drawings, detailed cost estimates, necessary calculations to determine and justify the engineering details for the Project, associated contract documentation to include detailed specifications, bill of quantities (BoQ), and implementation schedule for the Project. Such detailed specifications will contain those in relation to i) quality control of plant materials and workmanship, ii) safety, and iii) protection of the environment. The detailed design shall be prepared in close consultation with, and to meet the requirements of PMUDC and will be incorporated into the detailed design report to be submitted for approval of PMUDC;
- (e) Update classified traffic counts and axle load surveys along the project roads, and re-estimate future traffic volume and axle loads to a level of accuracy necessary for designing appropriate pavement structures and corresponding layer thicknesses;
- (f) Perform the followings based on the survey of the existing drainage systems: i) identify, design and quantify any necessary additional, replacement, or amendments to existing structures; ii) check

streambeds and cross-drainage channels above and below the roads for possible erosion effects; iii) design and quantify any necessary protective works; iv) examine the existing side drainage; and v) specify, design, and quantify new side drainage and line drains where necessary to eliminate scour and erosion or to provide support for narrow road cross sections;

- (g) Prepare practical and cost-effective pavement and retaining structure designs on the basis of condition surveys, projected traffic levels, pavement structure studies, and axle load considerations, as determined from the above activities and previous studies.
- (h) Assess the requirement for slope protection measures adjacent to the road, and design the most cost-effective remedial works. Verify and refine climate change adaptation options selected in the feasibility study.
- (i) Investigate, test, and define sources and estimated quantities of construction materials and prepare the material sources map with indicative properties, its applicability (i.e. for sub-grade, for sub-base, etc) and estimated quantities.
- (j) Assess the air pollution and noise impact to be caused by the Project based on the measured baseline data (background noise) and define appropriate mitigation measures.
- (k) Prepare a framework of traffic control system (including traffic signs, traffic signals and road marking);
- (l) Prepare a practical construction plan to show the scheduled progress of works.
- (m) Prepare the detailed design of administration office of Employer/Consultants;
- (n) Prepare the detailed design for facilities of maintenance such as road lighting, telecommunications system, lightning system, air navigation obstruction light system and ship navigation system based on Vietnamese regulation; and
- (o) Prepare layout planning of bridge monitoring system and technical specification for construction stage.

2. Tender Assistance (T/A)

- Assistance in Pre-Qualification (P/Q)

The Consultant shall:

- (a) Define technical and financial requirements, capacity and/or experience for P/Q criteria taking into consideration technical feature of the Project;
 - (b) Prepare P/Q documents in accordance with the latest version of Standard Prequalification
-

Documents under Japanese ODA Loans;

- (c) Assist PMUDC in P/Q announcement, addendum/corrigendum, and clarifications to the applicants' queries;
 - (d) Evaluate P/Q applications in accordance with the criteria set forth in P/Q documents; and
 - (e) Prepare a P/Q evaluation report for approval of the PQ evaluation committee.
- Assistance in the Bidding Procedures

The Consultant shall:

- (a) Prepare bidding documents in accordance with the latest version of Standard Bidding Documents under Japanese ODA Loans for Procurement of Works together with all relevant specifications, drawings and other documents;
- (b) Prepare bidding documents which includes i) clauses stating that the Contractor is to comply with the requirement of the Environmental Management Plan (EMP) and JICA Guidelines for Environmental and Social Considerations (April 2010) (JICA Environmental Guidelines), ii) the specification clearly stipulating the safety requirements in accordance with the laws and regulations in the country of the Borrower, relevant international standards (including guidelines of international organization), if any, and also in consideration of "the Guidance for the Management of Safety for Construction Works in Japanese ODA Projects of JICA," iii) the requirement to furnish a safety plan to meet the safety requirements, iv) the requirement for the personnel for key positions to include an accident prevention officer, and v) the requirement to submit method statements of safety to PMUDC and the consultant at the construction stage.
- (c) Assist PMUDC in issuing bid invitation, conducting pre-bid conferences, issuing addendum/corrigendum, and clarifications to bidders' queries.
- (d) Evaluate bids in accordance with the criteria set forth in the bidding documents. In such evaluation, the Consultant shall carefully confirm that bidders' submissions in their technical proposal including, but not limited to, site organization, mobilization schedule, method statement, construction schedule, safety plan, and EMP have been prepared in harmony each other and will meet such requirements set forth in applicable laws and regulations, specifications and other parts of the bidding documents;
- (e) Prepare a bid evaluation report for approval of the bid evaluation committee;
- (f) Assist PMUDC in contract negotiation by preparing agenda and facilitating negotiations including preparation of minutes of negotiation meeting; and

- (g) Prepare a draft and final contract agreement.

3. Construction Supervision (C/S)

The Consultant shall perform his duties during the contract implementation period of the contracts to be executed by the Employer and the Contractor. FIDIC MDB Harmonized Edition (2010) complemented with the Specific Provisions as included in the Standard Bidding Documents under Japanese ODA Loans for Procurement of Works will be applied to the civil works of the Project. In this context, the Consultant shall:

- (a) Act as the Engineer to execute construction supervision and contract administration services in accordance with the power and authority to be delegated by the Employer;
- (b) Provide assistance to the Employer concerning variations and claims which are to be ordered / issued at the initiative of the Employer. Advise the Employer on resolution of any dispute with the Contractor;
- (c) Issue the commencement order to the Contractors;
- (d) Provide recommendation to the Employer for acceptance of the Contractor's performance security, advance payment security and required insurances;
- (e) Review and approve the proposals submitted by the contractors which include work program, method statements, material sources, man-power, and equipment deployment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans, April 2012, the Consultant shall pay attention, in particular, to whether such proposals will meet the safety requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract;
- (f) Explain and/or adjust ambiguities and/or discrepancies in the Contract Documents and issue any necessary clarifications or instructions. Issue further drawings and give instructions to the Contractor for any works which may not be sufficiently detailed in the contract documents, if any;
- (g) Review, verify and further detail the design of the works, approve the Contractor's working drawings, shop drawings and drawings for temporary works, and if necessary, issue further drawings and/or give instructions to the Contractor;. Also review and approve, if any, design prepared by the Contractor for any part of the permanent works;
- (h) Liaise with the appropriate authorities to ensure that all the affected utility services are promptly relocated;
- (i) Carry out field inspections on the Contractor's setting out to ensure that the works are carried out in accordance with drawings and other design details.

- (j) Regularly monitor physical and financial progress against the milestones as per the contract and take appropriate action to expedite progress if necessary, so as to ensure completion of contract in time;
- (k) Supervise the works so that all the contractual requirements will be met by the contractors, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment. In light of Section 3.03 of Guidelines for the Employment of Consultants under Japanese ODA Loans (April 2012), the Consultant shall confirm that an accident prevention officer proposed by contractor is duly assigned at the project site and that construction works are carried out according to the requirements set forth in the applicable laws and regulations, the specifications or other parts of the contract ;If any questions are recognized regarding the safety measures, require the Contractor to take appropriate remedies;
- (l) Supervise the works so that all the contractual requirements are met by the Contractor, including those in relation to i) quality of the works, ii) safety and iii) protection of the environment. Confirm that an accident prevention officer proposed by the Contractor is duly assigned at the project site;
- (m) Supervise field tests, sampling and laboratory test to be carried out by the Contractor;
- (n) Inspect the construction method, equipment to be used, workmanship at the site, and attend shop inspection and manufacturing tests in accordance with the specifications;
- (o) Survey and measure the work output performed by the Contractor, verify statements submitted by the Contractor and issue payment certificates such as interim payment certificates and final payment certificate as specified in the contract;
- (p) Coordinate the works among different contractors employed for the Project;
- (q) Modify the designs, technical specifications and drawings, relevant calculations and cost estimates as may be necessary in accordance with the actual site conditions, and issue variation orders (including necessary actions in relation to the works performed by other contractors working for other projects, if any);
- (r) Carry out timely reporting to the Employer for any inconsistency in executing the works and suggesting appropriate corrective measures to be applied;
- (s) Inspect, verify and fairly determine claims issued by the parties (i.e. the Employer and Contractor) in accordance with the contract;
- (t) Perform the inspection of the works, including Test on Completion, and to issue certificates such as the Taking-Over Certificate, Performance Certificate as specified in the civil works contract;
- (u) Supervise commissioning and carry out tests during the commissioning;

- (v) Provide periodic and/or continuous inspection services during defects notification period and if any defects are noted, instruct the Contractor to rectify;
 - (w) Prepare as-built drawings for the parts of the works constructed in accordance with the design provided by the Employer. Check and certify as-built drawings for the parts of the works designed by the Contractor, if any;
 - (x) Prepare and submit an operation and maintenance manual for the facilities constructed in the Project;
 - (y) Prepare and submit reports to the Employer, which are detailed in Chapter 6 in relation to the implementation of the Project;
 - (z) Prepare and submit Due Diligence Report for resettlement;
 - (aa) Prepare guideline for monitoring system and bridge maintenance; and
 - (bb) Organize, as necessary, management meetings with the Contractor to review the arrangements for future work. Prepare and deliver minutes of such meetings to the Employer and the Contractor;
4. Facilitation of Implementation of Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and Resettlement Action Plan (RAP)

The Consultant shall:

- (a) Update EMP as appropriate; incorporate necessary technical specifications with design and contract documentation;
 - (b) Assist PMUDC in dissemination and explanation of additionally confirmed and identified environmental issues to public including holding public consultations;
 - (c) During the preparation of bidding documents, clearly identify environmental responsibilities as explained in the EIA and EMP;
 - (d) Assist PMUDC to review the Construction Contractor's Environmental Program to be prepared by the contractor in accordance with EMP, relevant plans and JICA Environmental Guidelines and to make recommendations to PMUDC regarding any necessary amendments for its approval;
 - (e) Assist PMUDC to implement the measures identified in the EMP;
 - (f) Monitor the effectiveness of EMP and negative impacts on environment caused by the construction works and provide technical advice, including a feasible solution, so that PMUDC can improve situation when necessary;
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- (g) Assist PMUDC in monitoring the compliance with conditions stated in the requirements under EMP and JICA Environmental Guidelines;
- (h) Assist PMUDC in preparation of the answer to the request from JICA's advisory committee for environmental and social considerations if necessary;
- (i) Assist PMUDC in the capacity building of PMUDC staff on environmental management through on-the-job training on environmental assessment techniques, mitigation measure planning, supervision and monitoring, and reporting;
- (j) Update and/or prepare Resettlement Policy Framework (RPF) and Compensation, Assistance, and Resettlement Plan (CAR Plan) as necessary based on detailed design in accordance with the agreed Resettlement Action Plan (RAP) and original RPF, including entitlement matrix and compensation plan; coordinate with various agencies in preparing the procedures for timely land acquisition and disbursement of compensation to project affected persons (PAPs);
- (k) Assist PMUDC in identifying the eligible PAPs, and in preparation/updating of the list of eligible PAPs and 'Payment Statement' for individual eligible PAPs. The places where each eligible PAPs will relocate to are necessary to be recorded so that PMUDC could implement monitoring on income and living conditions of resettled persons;
- (l) Assist PMUDC in conducting social assessment during early stage of the detailed design stage and review the existing income restoration plan and special assistance plan for vulnerable PAPs and revise/update the contents of the plans if necessary based on priorities identified with support of relevant government agencies and Non-Governmental Organizations (NGOs). The following contents should be included in the plans;
 - i. Skills Training
 - ii. Project related Job Opportunities
 - iii. Provision of social welfare grant
 - iv. Provision of Agricultural Extension Services
 - v. Provision of the special allowance to vulnerable PAPs
- (m) Assist PMUDC to implement the measures identified in the revised RAP;
- (n) Monitor land acquisition and compensation activities being undertaken by PMUDC and/or competent authorities, and report the results in monthly progress reports;
- (o) Assist in procurement of Implementation NGO (INGO) and external monitoring agency (EMA). Sample ToR for INGO/EMA is attached as XX;
- (p) Assist PMUDC in facilitating stakeholder's participation (including focus group discussions for vulnerable PAPs) and providing feedback their comments on RPF and/or CAR Plan;

- (q) Assist PMUDC in establishment of grievance redress mechanism including formation of Grievance Redress Committee;
- (r) Assist PMUDC to ensure that the PAPs are fully aware of the grievance redress procedure and the process of bringing their complaints, investigate the veracity of the complaints, and recommends actions/measures to settle them amicably, fairly and transparently before they go to the redress committee or the courts of law; and
- (s) Provide technical services with grievance redress committee for keeping and updating records when necessary.

5. Technology Transfer

The Consultant shall carry out the technology transfer as an important aspect in design and supervision works. The Consultant shall provide the opportunity to PMUDC officers and staffs to be involved in the working team of the Consultant during the design, contract administration and supervision works for their capacity building wherever possible. If requested by PMUDC, the Consultant shall brief and demonstrate the survey and design procedure, the construction supervision and contract management process and procedures as well as bridge maintenance. The consultant shall assist PMUDC and its staff to build their capacity as a part of on the job training under the Project.

Chapter 4. Expected Time Schedule

The total duration of consulting services will be 60 months followed by 24 months of defects liability period.

The implementation schedule expected is as shown in Table 4-1.

Table 4-1 Implementation Schedule Expected

Key Activities	Date	Duration in Months
Commencement of Consulting Services	01 October 2017	12
Completion of Detail Design, Preparation of Drawings and Tender Documents	31 September 2018	
Tender process including prequalification	01 July 2018 to 30 September 2019	15
Commencement of Construction	01 October 2019	36
End of Construction	30 September 2022	
Defect Liability Period	01 October 2022 to 30 September 2024	24
Termination of Consulting Services	30 September 2024	-

Chapter 5. Staffing (Expertise Required)

Seven (7) of Professional (A) consultants and five (5) of Professional (B) consultants will be engaged as for key team members, over 84 month duration of consulting services, a total of 266 man-months for Professional (A) and 228 man-months for Professional (B) consultants and total input by key team members will be 494 man-months.

(1) Qualification of Key Team Members

The qualification of key team members is shown in Table 5-1.

Table 5-1 Qualification of Key Team Members

Designation	Qualification
Project Manager (Pro-A)	<p><u>Education:</u></p> <ul style="list-style-type: none"> • Graduate in Civil Engineering <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in Highway Bridge Related Field: 20 years or more • Experience of consultant service for two cable structures over the length of 300m • Experience of consultant service for two highway bridge projects in ICB contract, of which each contract amount is more than USD 100 Million • at least two projects experience of leading a consultants' team as Team Leader
Senior Bridge Engineer (Pro-A)	<p><u>Education:</u></p> <p>Graduate in Civil Engineering</p> <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in design for Highway Bridges - 15 years • Experience of consultant service for two cable structures over the length of 300m • Experience as a bridge design specialist/structure engineer in 2 Highway bridges of size > USD 50 Million
Road Engineers (Traffic & Interchange) (Pro-A)	<p><u>Education:</u></p> <ul style="list-style-type: none"> • Graduate in Civil Engineering <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in Road Related Field - 15 years • Experience as a social consideration engineer in 2 arterial roads of size > USD 10 Million
Geotechnical Engineer (Pro-A)	<p><u>Education:</u></p> <ul style="list-style-type: none"> • Graduate in Civil Engineering or Geotechnical Engineering or relevant subject <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in Road Related Field - 10 years • Experience as a geotechnical engineer in 2 arterial roads of size > USD 10 Million

Document / Contract Specialist (Pro-A)	<p><u>Education:</u></p> <ul style="list-style-type: none"> • Graduate in Civil Engineering or relevant subject <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in Road Related Field - 10 years • Experience as a document/contract specialist in 2 arterial roads of size > USD 10 Million
Resident Engineer (Pro-A)	<p><u>Education:</u></p> <p>Graduate in Civil Engineering</p> <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in construction supervision for Highway Bridges - 15 years • Experience of consultant service for two cable structures over the length of 300m • Experience as a construction supervision engineer in 2 Highway bridges of size > USD 50 Million
Co-Project Manager (Pro-B)	<p><u>Education:</u></p> <ul style="list-style-type: none"> • Graduate in Civil Engineering <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in Road Related Field: 10 years or more • Experience of construction supervision for one road projects in ICB contract, of which each contract amount is more than USD 100 Million • At least one experience of leading a consultants' team as Team Leader or Deputy Team Leader
Senior Bridge Engineers (Pro-B)	<p><u>Education:</u></p> <p>Graduate in Civil Engineering</p> <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in design of Road Bridges - 10 years • Experience as a bridge design specialist/structure engineer in 2 highway bridges of size > USD 10 Million
Road Engineers (Traffic & Interchange) (Pro-B)	<p><u>Education:</u></p> <ul style="list-style-type: none"> • Graduate in Civil Engineering <p><u>Experience:</u></p> <ul style="list-style-type: none"> • Experience in Road Related Field: 10 years or more • Experience as a road design engineer in 2 arterial roads of size > USD 5 Million

Consultant may propose other experts and supporting staffs required to accomplish the tasks outlined in the ToR.

(2) Scope of Works for the Respective Personnel

Detailed information on the major tasks and duties each member of the detailed engineering design team and the construction supervision team shall perform is provided as follows in Table 5-2:

Table 5-2 Scope of Tasks and Duties for Personnel

No	Position	I or L	Major Tasks and Duties
Professional-A (Pro-A)			
A-1	Project Manger	I (Pro-A)	<ol style="list-style-type: none"> 1) Lead the detailed design task team. Ensure all deliverables are prepared in accordance with quality and time constraints. 2) Administer and supervise site investigation and design and documentation activities for the Project in contract. 3) Identify appropriate design codes and standards in collaboration with PMUDC. 4) Assess bridge structures for detailed engineering, including the type and condition of bridges. 5) Assess road sections for detailed engineering, including geometric features, and pavement. 6) Review the need for road safety measures based on the findings of the Preparatory Survey (PS) and road safety review of the road environment. 7) Assist PMUDC to prepare construction schedules showing anticipated progress of works by contract package. The schedules should reflect seasonal climatic effects at the work sites. 8) Based on the findings of the initial environmental examination (IEE), the bridge and road designs should incorporate the EMP to mitigate adverse environmental impacts including those encountered during construction. 9) Ensure that deliverables comply with relevant technical requirements, JICA conditions and the terms of the assumptions in the cost benefit analysis. 10) Ensure that the bid documents for bridge and road works include specific provisions to minimize disruption/damage to local settlements due to construction. 11) With assistance from the Document / Contract Specialist, prepare bridge and road bid documents. 12) With assistance from the Document / Contract Specialist, prepare tender documentation suitable for procurement under ICB with P/Q in accordance with the procurement guidelines of JICA. 13) Assist the PMUDC to appraise bids as part of the bid evaluation process. 14) Assist the PMUDC evaluate the capacity of contractors. 15) Prepare monthly progress reports and quarterly progress reports in a form agreed with the PMUDC and JICA, and submit the reports within 10 days before the end of the month or quarter to which they refer. 16) Prepare a final report, which will be a compilation and condensation of the data presented in regular monthly progress reports, together with copies of as-built drawings within two months from the issuance of the defects liability certificate.

No	Position	I or L	Major Tasks and Duties
			17) Prepare a final report for each and all contracts.
A-2	Senior Bridge Engineer (Metal)	I (Pro-A)	<ol style="list-style-type: none"> 1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge. 2) Examine design standards and specifications. 3) Prepare detailed design of main bridge, approach bridges and ramp bridges. 4) Coordinate and discuss with PMUDC, relevant authorities and survey teams. 5) Prepare pay items and quantities of bridges. 6) Assist in preparation of construction method and time schedule for erection of bridges. 7) Assist in preparation of cost estimate. 8) Assist in preparation of technical specifications. 9) Assist in preparation of reports. 10) Review the Contractor's calculation and drawings for bridge design. 11) Supervise the construction of bridge manufacturing and erection. 12) Prepare layout of bridge maintenance and management execution scheme. 13) Draft bridge maintenance and management guideline or manual.
A-3	Bridge Engineer (Substructure)	I (Pro-A)	<ol style="list-style-type: none"> 1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge. 2) Examine design standards and specifications. 3) Prepare detailed design of substructure of main bridge. 4) Prepare pay items and quantities of main bridge. 5) Prepare the construction method and time schedule for erection of main bridge. 6) Assist in preparation of cost estimate. 7) Assist in preparation of technical specifications. 8) Prepare the main bridge reports. 9) Review the Contractor's calculation and drawings for main bridge design. 10) Supervise the construction of main bridge manufacturing and erection.
A-4	Road Engineer (Traffic)	I (Pro-A)	<ol style="list-style-type: none"> 1) Review the PS and assess traffic conditions for detailed engineering, including the type and condition of interchanges 2) Examine design standards and specifications. 3) Ensure that construction is executed in accordance with all the provisions of the contract, including those concerning standards of workmanship, and other safety provisions and protection of the environment. 4) Ensure that as-built drawings are prepared for construction. 5) Establish control points, benchmarks and reference beacons as required to prepare detailed design that would enable calculation of construction quantity with reasonable accuracy (+/- 10%). 6) Assist PMUDC to prepare construction schedules showing anticipated progress of works by contract package. The schedules should reflect seasonal climatic

No	Position	I or L	Major Tasks and Duties
			<p>effects at the work sites.</p> <p>7) Prepare detailed engineering designs and bills of quantities, and calculate detailed cost estimates for road construction, with break-down into foreign (direct and indirect) and local components as well as taxes and duties.</p> <p>8) Prepare contract drawings for road works; including road plans, longitudinal profiles, cross sections, etc. Road plans should include all existing features and expected land-take based on plotted earthwork limits if so required.</p> <p>9) Update traffic forecast and propose their present / target figures.</p>
A-5	Bridge Engineer (PC)	I (Pro-A)	<p>1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge.</p> <p>2) Examine design standards and specifications.</p> <p>3) Prepare detailed design of main bridge.</p> <p>4) Prepare pay items and quantities of main bridge.</p> <p>5) Prepare the construction method and time schedule for erection of main bridge.</p> <p>6) Assist in preparation of cost estimate.</p> <p>7) Assist in preparation of technical specifications.</p> <p>8) Prepare the main bridge reports.</p> <p>9) Review the Contractor's calculation and drawings for main bridge design.</p> <p>10) Supervise the construction of main bridge manufacturing and erection.</p> <p>11) Prepare layout of bridge maintenance and management execution scheme.</p> <p>12) Draft bridge maintenance and management guideline or manual.</p>
A-6	Road Engineer (Interchanges)	I (Pro-A)	<p>1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge.</p> <p>2) Examine design standards and specifications.</p> <p>3) Ensure that construction is executed in accordance with all the provisions of the contract, including those concerning standards of workmanship, and other safety provisions and protection of the environment.</p> <p>4) Ensure that as-built drawings are prepared for construction.</p> <p>5) Establish control points, benchmarks and reference beacons as required to prepare detailed design that would enable calculation of construction quantity with reasonable accuracy (+/- 10%).</p> <p>6) Assist PMUDC to prepare construction schedules showing anticipated progress of works by contract package. The schedules should reflect seasonal climatic effects at the work sites.</p> <p>7) Prepare detailed engineering designs and bills of quantities, and calculate detailed cost estimates for road construction, with break-down into foreign (direct and indirect) and local components as well as taxes and duties.</p> <p>8) Prepare contract drawings for road works; including road</p>

No	Position	I or L	Major Tasks and Duties
			plans, longitudinal profiles, cross sections, etc. Road plans should include all existing features and expected land-take based on plotted earthwork limits if so required.
A-7	Pavement Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Review and prepare detailed design of pavement on road and bridge structures. 2) Examine and revise design standard and specifications regarding pavement. 3) Perform necessary subsoil investigations on representative sections of road, with samples to be taken at appropriate intervals for laboratory tests. 4) Investigate soft grounds and analyze and suggest countermeasures.
A-8	Geotechnical Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Review and analysis of soil data and result of laboratory test in previous study. 2) Study and determination of items for soil investigation and laboratory test. 3) Implementation of investigation and test. 4) Assistance in design works, which need soil data and analysis. 5) Preparation of reports on soil investigation and laboratory test.
A-9	Civil Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition for civil work structures, drainage system and protection work 2) Review the previous study. 3) Coordinate and discuss with survey teams. 4) Prepare detailed design on civil work structures including road and associated works. 5) Prepare detailed design on level crossing including box culvert. 6) Prepare detailed design for civil works.
A-10	Hydrological Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Review and evaluate the result of hydrological survey in the previous study. 2) Study and determine items and method for hydrological survey. 3) Implement and control survey. 4) Assist in design works of bridge and river training works. 5) Prepare reports on scouring riverbed and design standard.
A-11	Architectural Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition of the concerned administration office. 2) Prepare detailed design of administration office. 3) Prepare pay items and their quantities of administration office. 4) Assist in preparation of cost estimate. 5) Assist in preparation of technical specifications. 6) Assist in preparation of reports.
A-12	Electrical Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition of electric facilities. 2) Assist in preparing design of electric supply and facilities. 3) Prepare detailed design of electric supply for project facilities. 4) Check related regulation, standard and codes for electric

No	Position	I or L	Major Tasks and Duties
			<p>power supply.</p> <p>5) Arrange meeting with PMUDC and other authorities regarding electricity work process.</p> <p>6) Strengthen communication network with local stakeholders.</p> <p>7) Supervise the construction and the connection in all structures.</p>
A-13	Environment Specialist	I (Pro-A)	<p>1) Update EMP as appropriate; incorporate necessary technical specifications with design and contract documentation.</p> <p>2) Assist PMUDC in dissemination and explanation of additionally confirmed and identified environmental issues to public including holding public consultations.</p> <p>3) Assist PMUDC to implement the measures identified in the Project's Environmental Management Plan (EMP).</p> <p>4) Monitor the effectiveness of EMP (and CCEP) and negative impacts on environment caused by the construction works and provide technical advice, including a feasible solution, so that PMUDC can improve situation when necessary.</p> <p>5) Assist PMUDC in monitoring the compliance with conditions stated in the requirements under EMP and JICA Environmental Guidelines.</p>
A-14	Social Consideration Specialist	I (Pro-A)	<p>1) Update and/or prepare Resettlement Policy Framework (RPF), Compensation Assistance, and Resettlement Plan (CAR Plan) as necessary based on detailed design in accordance with the agreed Resettlement Action Plan (RAP) and original RPF, including entitlement matrix and compensation plan; coordinate with various agencies in preparing the procedures for timely land acquisition and disbursement of compensation to Project Affected Person (PAPs).</p> <p>2) Assist PMUDC in identifying the eligible PAPs, and in preparation/updating of the list of eligible PAPs and 'Payment Statement' for individual eligible PAPs. The places where each eligible PAPs will relocate to are necessary to be recorded so that PMUDC could implement monitoring on income and living conditions of resettled persons.</p> <p>3) Assist PMUDC in conducting social assessment during early stage of the detailed design stage and review the existing income restoration plan and special assistance plan for vulnerable PAPs and revise/update the contents of the plans if necessary based on priorities identified through the social assessment during detailed design stage with support of relevant government agencies and Non-Governmental Organizations (NGOs). The following contents should be included in the plans;</p> <ol style="list-style-type: none"> i. Skills Training ii. Project related Job Opportunities iii. Provision of social welfare grant iv. Provision of Agricultural Extension Services v. Provision of the special allowance to vulnerable PAPs

No	Position	I or L	Major Tasks and Duties
			<ol style="list-style-type: none"> 4) Assist PMUDC to implement the measures identified in the Project's Resettlement Action Plan (RAP). 5) Monitor land acquisition and compensation activities being undertaken by PMUDC and/or competent authorities, and report the results in monthly progress reports. 6) Assist in procurement of Implementation NGO (INGO) and external monitoring agency (EMA). 7) Assist PMUDC in facilitating stakeholder's participation (including focus group discussions for vulnerable PAPs) and providing feedback their comments on RPF and/or CAR Plan. 8) Assist PMUDC in establishment of grievance redress mechanism including formation of Grievance Redress Committee. 9) Assist PMUDC to ensure that the PAPs are fully aware of the grievance redress procedure and the process of bringing their complaints, investigate the veracity of the complaints, and recommends actions/measures to settle them amicably, fairly and transparently before they go to the redress committee or the courts of law; 10) Provide technical services with grievance redress committee for keeping and updating records when necessary. 11) Provide skills transfer with respect to resettlement and land acquisition, through workshops, seminars, and on-the-job training, to the relevant regional engineers and district coordinators.
A-15	Document / Contract Specialist	I (Pro-A)	<ol style="list-style-type: none"> 1) Assist PMUDC to design, administer and monitor all procurement activities to ensure compliance with agreed procurement frameworks. 2) Prepare pre-qualification (P/Q) documents in compliance with JICA and Vietnamese procurement guidelines. P/Q documents will be prepared for ICB for bridge construction and LCB for civil works. 3) Assist PMUDC in pre-qualification in accordance with the P/Q documents and prepare P/Q reports for approval of PMUDC and JICA. 4) Prepare bid documents in compliance with JICA and Vietnamese procurement guidelines. Bid documents will be prepared for ICB for bridge construction and LCB for civil works. 5) Assist PMUDC in the preparation of invitation for bids, evaluation of bids received, and award of construction contracts.
A-16	Cost Estimation Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Survey and investigate the market condition including process of materials, depreciation/operation cost of construction plant and man-power information in detailed design stage. 2) Review the previous study on pay items and unit prices prepared in the cost estimate. 3) Examine and analyze rate of progress for man-power and equipment.

No	Position	I or L	Major Tasks and Duties
			<ol style="list-style-type: none"> 4) Analyze unit price for individual pay item; prepare pay items of BOQ in collaboration with Document / Contract Specialist. 5) Assist in preparation of bidding documents. 6) Finalize BOQ for bidding documents for construction. 7) Prepare the Cost Estimate Report for whole construction works. 8) Assist in evaluation of P/Q and bids.
A-17	Material Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Verify the Contractor's procedures for material testing and the setting up of the materials testing laboratory. 2) Verify that all materials used in the execution of the Project fully meet the Specification, if necessary. 3) Verify the Contractor's steel fabrication plant and member assembling to ensure that all steel members fabricated/assembled to meet fully the specification. 4) Verify the Contractor's concrete production plant and concrete trial mixes to ensure that all concrete grades produced meet fully the specification.
A-18	Quantity Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Conduct quantity estimation based on the detailed design drawings and technical specifications. 2) Check and approve quality and quantity of materials supplied for construction works. 3) Check and approve quality and quantity of works completed in certain period. 4) Assist in issuance of monthly certificate for payment. 5) Evaluate change orders declared by the Contractor. 6) Assist in preparing monthly progress report. 7) Check financial and physical progress.
A-19	Safety Specialist	I (Pro-A)	<ol style="list-style-type: none"> 1) Ensure that the contractors provide sufficient safety devices and sign boards for own safety as well as safety of general traffic and pedestrians during construction. 2) Advise the Social Consideration Engineer and Environmental Specialist to undertake environmental monitoring and take necessary actions. Also ensure the incorporation of the findings and supporting data into the project completion reports.
A-20	Resident Engineer	I (Pro-A)	<ol style="list-style-type: none"> 1) Lead the construction supervision task teams. Ensure all deliverables are prepared in accordance with quality and time constraints. 2) Ensure full and detailed permanent site records, which will include site correspondence, survey data, quality acceptance data, site diaries, measurement and certification, minutes of meetings, and records of all other contractually relevant matters. 3) Certify advance payments in accordance with the contracts when necessary. 4) Certify interim and final payment certificates for submission to the employer, and assist the employer in preparing loan withdrawal documentation for submission to JICA through PMUDC. 5) Provide training to local road maintenance contractors in accordance with approved training plans. 6) Ensure that all supervision team members undertake comprehensive day-to-day field contract supervision,

No	Position	I or L	Major Tasks and Duties
			<p>quality assurance, measurements and administration services at the site.</p> <p>7) Instruct and advise all supervision team members to maintain full and detailed permanent site records, which will include site correspondence, survey data, quality acceptance data, site diaries, measurement and certification, minutes of meetings, and records of all other contractually relevant matters.</p> <p>8) Provide the contractors with all necessary survey data and reference for setting out the works.</p> <p>9) Receive, assess and approve the contractors' implementation work plans and programs.</p> <p>10) Ensure that construction is executed in accordance with all the provisions of the contract, including those concerning standards of workmanship, and other safety provisions and protection of the environment.</p> <p>11) Maintain regular estimates of the cost to completion and time to completion for each contract.</p> <p>12) Assess time and cost claims submitted by contractors and advise the PMUDC for actions to be taken.</p> <p>13) Ensure that as-built drawings are prepared for construction.</p> <p>14) Attend the periodical site inspection during the defects liability period and order the contractors' actions to be taken and payment methods.</p>
Professional-B (Pro-B)			
B-1	Co-Project Manager	L (Pro-B)	<p>1) Assist Project Manager in managing the consultant team.</p> <p>2) Direct, coordinate and supervise all engineering services.</p> <p>3) Supervise of the overall administration of the project.</p> <p>4) Liaise with PMUDC, relevant organization and internal members.</p> <p>5) Overall supervision of technical activities and guidance on design and construction.</p> <p>6) Prepare all reports and explanation.</p> <p>7) Assist on P/Q and bidding processes.</p> <p>8) Supervise implementation of on the job training in design and construction stages.</p> <p>9) Manage material/equipment inspection, construction supervision and environmental monitoring and reporting.</p> <p>10) Supervise implementation of mitigation of environmental impact.</p> <p>11) Arrange hand-over process for works completed.</p> <p>12) Enhance of service quality in survey, design and construction.</p>
B-2	Senior Bridge Engineer (Metal & PC)	L (Pro-B)	<p>1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge.</p> <p>2) Examine design standards and specifications.</p> <p>3) Prepare detailed design of approach bridges and ramp bridges.</p> <p>4) Coordinate and discuss with PMUDC, relevant authorities and survey teams.</p> <p>5) Prepare pay items and quantities of bridges.</p> <p>6) Assist in preparation of construction method and time</p>

No	Position	I or L	Major Tasks and Duties
			<p>schedule for erection of bridges.</p> <p>7) Assist in preparation of cost estimate.</p> <p>8) Assist in preparation of technical specifications.</p> <p>9) Assist in preparation of reports.</p> <p>10) Review the Contractor's calculation and drawings for bridge design.</p> <p>11) Supervise the construction of bridge manufacturing and erection.</p> <p>12) Prepare layout of bridge maintenance and management execution scheme.</p> <p>13) Draft bridge maintenance and management guideline or manual.</p>
B-3	Bridge Engineer (Substructure)	L (Pro-B)	<p>1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge.</p> <p>2) Examine design standards and specifications.</p> <p>3) Prepare detailed design of foundation of approach bridges and ramp bridges.</p> <p>4) Prepare pay items and quantities of bridges.</p> <p>5) Prepare the construction method and time schedule for erection of bridges.</p> <p>6) Assist in preparation of cost estimate.</p> <p>7) Assist in preparation of technical specifications.</p> <p>8) Prepare the bridges reports.</p> <p>9) Review the Contractor's calculation and drawings for bridges design.</p> <p>10) Supervise the construction of bridges manufacturing and erection.</p> <p>11) Prepare layout of bridge maintenance and management execution scheme.</p> <p>12) Draft bridge maintenance and management guideline or manual.</p>
B-4	Road Engineer (Traffic)	L (Pro-B)	<p>1) Review the PS and assess traffic conditions for detailed engineering, including the type and condition of interchanges</p> <p>2) Examine design standards and specifications.</p> <p>3) Ensure that construction is executed in accordance with all the provisions of the contract, including those concerning standards of workmanship, and other safety provisions and protection of the environment.</p> <p>4) Ensure that as-built drawings are prepared for construction.</p> <p>5) Establish control points, benchmarks and reference beacons as required to prepare detailed design that would enable calculation of construction quantity with reasonable accuracy (+/- 10%).</p> <p>6) Assist PMUDC to prepare construction schedules showing anticipated progress of works by contract package. The schedules should reflect seasonal climatic effects at the work sites.</p> <p>7) Prepare detailed engineering designs and bills of quantities, and calculate detailed cost estimates for road construction, with break-down into foreign (direct and indirect) and local components as well as taxes and duties.</p>

No	Position	I or L	Major Tasks and Duties
			8) Prepare contract drawings for road works; including road plans, longitudinal profiles, cross sections, etc. Road plans should include all existing features and expected land-take based on plotted earthwork limits if so required. 9) Update traffic forecast and propose their present / target figures.
B-5	Bridge Engineer (Metal & PC)	L (Pro-B)	1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge. 2) Examine design standards and specifications. 3) Prepare detailed design of approach bridges and ramp bridges. 4) Coordinate and discuss with PMUDC, relevant authorities and survey teams. 5) Prepare pay items and quantities of bridges. 6) Assist in preparation of construction method and time schedule for erection of bridges. 7) Assist in preparation of cost estimate. 8) Assist in preparation of technical specifications. 9) Assist in preparation of reports. 10) Review the Contractor's calculation and drawings for bridge design. 11) Supervise the construction of bridge manufacturing and erection. 12) Prepare layout of bridge maintenance and management execution scheme. 13) Draft bridge maintenance and management guideline or manual.
B-6	Road Engineer (Interchanges)	L (Pro-B)	1) Review the PS and assess bridge structure for detailed engineering, including the type and condition of bridge. 2) Examine design standards and specifications. 3) Ensure that construction is executed in accordance with all the provisions of the contract, including those concerning standards of workmanship, and other safety provisions and protection of the environment. 4) Ensure that as-built drawings are prepared for construction. 5) Establish control points, benchmarks and reference beacons as required to prepare detailed design that would enable calculation of construction quantity with reasonable accuracy (+/- 10%). 6) Assist PMUDC to prepare construction schedules showing anticipated progress of works by contract package. The schedules should reflect seasonal climatic effects at the work sites. 7) Prepare detailed engineering designs and bills of quantities, and calculate detailed cost estimates for road construction, with break-down into foreign (direct and indirect) and local components as well as taxes and duties. 8) Prepare contract drawings for road works; including road plans, longitudinal profiles, cross sections, etc. Road plans should include all existing features and expected

No	Position	I or L	Major Tasks and Duties
			land-take based on plotted earthwork limits if so required.
B-7	Pavement Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Review and prepare detailed design of pavement on road and bridge structures. 2) Examine and revise design standard and specifications regarding pavement. 3) Perform necessary subsoil investigations on representative sections of road, with samples to be taken at appropriate intervals for laboratory tests. 4) Investigate soft grounds and analyze and suggest countermeasures.
B-8	Geotechnical Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Review and analysis of soil data and result of laboratory test in previous study. 2) Study and determination of items for soil investigation and laboratory test. 3) Implementation of investigation and test. 4) Assistance in design works, which need soil data and analysis. 5) Preparation of reports on soil investigation and laboratory test.
B-9	Civil Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition for civil work structures, drainage system and protection work. 2) Review the previous study. 3) Coordinate and discuss with survey teams. 4) Prepare detailed design on civil work structures including road and associated works. 5) Prepare detailed design on level crossing including box culvert. 6) Prepare detailed design.
B-10	Drainage Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition of water supply, drainage and sewage facilities. 2) Assist in preparing design of water supply, drainage and sewage facilities. 3) Check related regulation, standard and codes for water supply and sewage. 4) Arrange meeting with PMDUC and other authorities 5) Strengthen communication network with local stakeholders. 6) Check shop drawings for water supply, drainage and sewage works. 7) Review of construction method for water supply, drainage and sewage system. 8) Review bill of quantities for water supply, drainage and sewage works. 9) Inspect materials for water supply, drainage and sewage works in accordance with technical specification. 10) Supervise the construction and connection with external water supply, drainage and sewage system.
B-11	Hydrological Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Review and evaluate the result of hydrological survey in the previous study. 2) Study and determine items and method for hydrological survey. 3) Implement and control survey. 4) Assist in design works of bridge and river training works.

No	Position	I or L	Major Tasks and Duties
			<ol style="list-style-type: none"> 5) Prepare reports on scouring riverbed and design standard. 6) Prepare hydrology and hydraulics report for each drainage structure.
B-12	Architectural Engineer	I (Pro-B)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition of the concerned administration office. 2) Prepare detailed design of administration office. 3) Prepare pay items and their quantities of administration office. 4) Assist in preparation of cost estimate. 5) Assist in preparation of technical specifications. 6) Assist in preparation of reports.
B-13	Electrical Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Survey and investigate the present condition of electric facilities. 2) Assist in preparing design of electric supply and facilities. 3) Prepare detailed design of electric supply for project facilities. 4) Check related regulation, standard and codes for electric power supply. 5) Arrange meeting with PMUDC and other authorities regarding electricity work process. 6) Strengthen communication network with local stakeholders. 7) Supervise the construction and the connection in all structures.
B-14	Environment Specialist	L (Pro-B)	<ol style="list-style-type: none"> 1) Update EMP as appropriate; incorporate necessary technical specifications with design and contract documentation. 2) Assist PMUDC in dissemination and explanation of additionally confirmed and identified environmental issues to public including holding public consultations. 3) Assist PMUDC to implement the measures identified in the Project's Environmental Management Plan (EMP). 4) Monitor the effectiveness of EMP (and CCEP) and negative impacts on environment caused by the construction works and provide technical advice, including a feasible solution, so that PMUDC can improve situation when necessary. 5) Assist PMUDC in monitoring the compliance with conditions stated in the requirements under EMP and JICA Environmental Guidelines.
B-15	Social Consideration Specialist	L (Pro-B)	<ol style="list-style-type: none"> 1) Update and/or prepare Resettlement Policy Framework (RPF), Compensation Assistance, and Resettlement Plan (CAR Plan) as necessary based on detailed design in accordance with the agreed Resettlement Action Plan (RAP) and original RPF, including entitlement matrix and compensation plan; coordinate with various agencies in preparing the procedures for timely land acquisition and disbursement of compensation to Project Affected Person (PAPs). 2) Assist PMUDC in identifying the eligible PAPs, and in preparation/updating of the list of eligible PAPs and 'Payment Statement' for individual eligible PAPs. The

No	Position	I or L	Major Tasks and Duties
			<p>places where each eligible PAPs will relocate to are necessary to be recorded so that PMUDC could implement monitoring on income and living conditions of resettled persons.</p> <ol style="list-style-type: none"> 3) Assist PMUDC in conducting social assessment during early stage of the detailed design stage and review the existing income restoration plan and special assistance plan for vulnerable PAPs and revise/update the contents of the plans if necessary based on priorities identified through the social assessment during detailed design stage with support of relevant government agencies and Non-Governmental Organizations (NGOs). The following contents should be included in the plans; <ol style="list-style-type: none"> i. Skills Training ii. Project related Job Opportunities iii. Provision of social welfare grant iv. Provision of Agricultural Extension Services v. Provision of the special allowance to vulnerable PAPs 4) Assist PMUDC to implement the measures identified in the Project's Resettlement Action Plan (RAP). 5) Monitor land acquisition and compensation activities being undertaken by PMUDC and/or competent authorities, and report the results in monthly progress reports. 6) Assist in procurement of Implementation NGO (INGO) and external monitoring agency (EMA). 7) Assist PMUDC in facilitating stakeholder's participation (including focus group discussions for vulnerable PAPs) and providing feedback their comments on RPF and/or CAR Plan. 8) Assist PMUDC in establishment of grievance redress mechanism including formation of Grievance Redress Committee. 9) Assist PMUDC to ensure that the PAPs are fully aware of the grievance redress procedure and the process of bringing their complaints, investigate the veracity of the complaints, and recommends actions/measures to settle them amicably, fairly and transparently before they go to the redress committee or the courts of law. 10) Provide technical services with grievance redress committee for keeping and updating records when necessary. 11) Provide skills transfer with respect to resettlement and land acquisition, through workshops, seminars, and on-the-job training, to the relevant regional engineers and district coordinators.
B-16	Document / Contract Specialist	L (Pro-B)	<ol style="list-style-type: none"> 1) Assist PMUDC to design, administer and monitor all procurement activities to ensure compliance with agreed procurement frameworks. 2) Prepare pre-qualification (P/Q) documents in compliance with JICA and Vietnamese procurement guidelines. P/Q documents will be prepared for ICB for bridge construction and LCB for civil works.

No	Position	I or L	Major Tasks and Duties
			<ol style="list-style-type: none"> 3) Assist PMUDC in pre-qualification in accordance with the P/Q documents and prepare P/Q reports for approval of PMUDC and JICA. 4) Prepare bid documents in compliance with JICA and Vietnamese procurement guidelines. Bid documents will be prepared for ICB for bridge construction and LCB for civil works. 5) Assist PMUDC in the preparation of invitation for bids, evaluation of bids received, and award of construction contracts.
B-17	Cost Estimation Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Survey and investigate the market condition including process of materials, depreciation/operation cost of construction plant and man-power information in detailed design stage. 2) Review the previous study on pay items and unit prices prepared in the cost estimate. 3) Examine and analyze rate of progress for man-power and equipment. 4) Analyze unit price for individual pay item; prepare pay items of BOQ in collaboration with Document / Contract Specialist. 5) Assist in preparation of bidding documents. 6) Finalize BOQ for bidding documents for construction. 7) Prepare the Cost Estimate Report for whole construction works. 8) Assist in evaluation of P/Q and bids.
B-18	Material Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Verify the Contractor's procedures for material testing and the setting up of the materials testing laboratory. 2) Verify that all materials used in the execution of the Project fully meet the Specification. If necessary. 3) Verify the Contractor's steel fabrication plant and member assembling to ensure that all steel members fabricated/assembled to meet fully the specification. 4) Verify the Contractor's concrete production plant and concrete trial mixes to ensure that all concrete grades produced meet fully the specification.
B-19	Quantity Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Conduct quantity estimation based on the detailed design drawings and technical specifications. 2) Check and approve quality and quantity of materials supplied for construction works. 3) Check and approve quality and quantity of works completed in certain period. 4) Assist in issuance of monthly certificate for payment. 5) Evaluate change orders declared by the Contractor. 6) Assist in preparing monthly progress report. 7) Check financial and physical progress.
B-20	Safety Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Ensure that the contractors provide sufficient safety devices and sign boards for own safety as well as safety of general traffic and pedestrians during construction. 2) Advise the Social Consideration Engineer and Environmental Specialist to undertake environmental monitoring and take necessary actions. Also ensure the incorporation of the findings and supporting data into the

No	Position	I or L	Major Tasks and Duties
			project completion reports.
B-21	Co-Resident Engineer	L (Pro-B)	<ol style="list-style-type: none"> 1) Assist President Engineer in construction supervision task teams. 2) Lead the construction supervision task teams. Ensure all deliverables are prepared in accordance with quality and time constraints. 3) Ensure full and detailed permanent site records, which will include site correspondence, survey data, quality acceptance data, site diaries, measurement and certification, minutes of meetings, and records of all other contractually relevant matters. 4) Certify advance payments in accordance with the contracts when necessary. 5) Certify interim and final payment certificates for submission to the employer, and assist the employer in preparing loan withdrawal documentation for submission to JICA through PMUDC. 6) Provide training to local road maintenance contractors in accordance with approved training plans. 7) Ensure that all supervision team members undertake comprehensive day-to-day field contract supervision, quality assurance, measurements and administration services at the site. 8) Instruct and advise all supervision team members to maintain full and detailed permanent site records, which will include site correspondence, survey data, quality acceptance data, site diaries, measurement and certification, minutes of meetings, and records of all other contractually relevant matters. 9) Provide the contractors with all necessary survey data and reference for setting out the works. 10) Receive, assess and approve the contractors' implementation work plans and programs. 11) Ensure that construction is executed in accordance with all the provisions of the contract, including those concerning standards of workmanship, and other safety provisions and protection of the environment. 12) Maintain regular estimates of the cost to completion and time to completion for each contract. 13) Assess time and cost claims submitted by contractors and advise the PMUDC for actions to be taken. 14) Ensure that as-built drawings are prepared for construction. 15) Attend the periodical site inspection during the defects liability period and order the contractors' actions to be taken and payment methods.
Supporting Staff (SS)			
C-1	Office Manager	L (SS)	<ol style="list-style-type: none"> 1) Control all administration of the Consultant team in cooperation with Project Manager. 2) Establish and implement an effective administration and accounting system in cooperation with supporting staff. 3) Supervise and record mobilization and demobilization of all engineers and staff for preparing the claim for payment.

No	Position	I or L	Major Tasks and Duties
			4) Discuss the contractual matters under the consulting services in coordination with Project Manager if necessary.
C-2	Office Clerk	L (SS)	1) Perform regular business service including keeping records, office tasks or filling document.
C-3	Secretary	L (SS)	1) Assist in working with Project Manager.
C-4	Translator	L (SS)	1) Translate document in Vietnamese to English and conversely. 2) Assist in communicating with international and local engineers.
C-5	Janitor	L (SS)	1) Carry out maintenance and security duties of office 2) Clean office and make minor repairs.
C-6	Cad Operator	L (SS)	1) Establish CAD rules in the Consultant team. 2) Process CAD drawings. 3) Archive and update CAD database and design drawings. 4) Assist engineers in completing design drawings following designated drawing format. 5) Assist in preparation of design reports.
C-7	Accountant	L (SS)	1) Carry out formal banking, business dealing, and other financial transactions. 2) Manage checking, savings, or expense.

Chapter 6. Reporting

Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to PMUDC as shown in Table 6-1. The Consultant shall provide electronic copy of each of these reports.

Table 6-1 Reports for Submission

#	Type of Report	Timing and Contents	No. of Copies
Consultancy Services			
1	Inception Report	To be submitted within 1 month after the commencement of the services, presenting the methodologies, schedule, organization, etc.	10
2	Monthly Progress Report	Describes briefly and concisely all activities and progress for the previous month by the 10th day of each month. Problems encountered or anticipated will be clearly stated, together with actions to be taken or recommendations on remedial measures for correction. Also indicates the work to be performed during the coming month.	10
3	Quarterly Progress Report	To be submitted at every three (3) months during consulting services, presenting the progress status of the Project.	10
4	Project Completion Report (for submission to JICA)	To be submitted within three (3) month after completion of consulting services.	10
Detailed Design			
5	Project Definition Report	To be submitted in the 3rd month after the commencement of services, presenting the design criteria and standards.	20
6	Final Detailed Design Report and Drawings	To be submitted in the 10th month after the commencement of services, presenting design items and drawings.	20
7	Cost Estimate and BOQ Report	To be submitted in the 10th month after the commencement of services, presenting detailed cost estimate and bill of quantity.	20
8	Final Design Report	To be submitted in the 12th month after the commencement of services, finalizing detailed design, cost estimate, and bill of quantity.	20
Tender Assistance			
9	Pre-qualification Document Report	To be submitted in the 12th month after the commencement of the services, presenting the pre-qualification documents and its evaluation criteria.	20
10	Bidding Document Report	To be submitted in the 14th month after the commencement of the services, presenting the bidding documents and bid evaluation criteria.	20
11	Pre-qualification Evaluation Report	To be submitted after prequalification process, presenting the results of the evaluation and the selection of the qualified applicants.	15
12	Technical Evaluation Report	To be submitted after technical evaluation process, presenting the results of technical evaluation and the recommendation of the qualified applicants.	15
13	Tender Evaluation Report	To be submitted after tender assistance service,	15

		presenting the results of the tenders to select the most responsible contractors.	
14	Due Diligence Report on Resettlement	To be submitted after tender assistance service, presenting the result of due diligence activity on resettlement.	10
Construction Supervision			
15	Monthly Progress Report	To be submitted by the second week of next month, presenting the progress status in construction.	15
16	Quarterly Progress Report	To be submitted at every three (3) months during construction, presenting the progress status in construction.	15
17	Quality Control Report	To be submitted every month during construction, presenting quality control status based on quality criteria or specification.	10
18	Operation and Maintenance Manual	To be submitted at the end of construction, containing technical procedures for the appropriate operation and maintenance of project facilities.	20
19	Construction Completion Report and As-built Drawings	To be submitted within three (3) month after completion of construction, which comprises a full size of as-built drawings for all the structures and facilities completed, and the final details of the construction completed together with all data, records, material tests results, field books.	20
Training			
20	Training Plan	At appropriate timing in accordance with the Inception Report	10
21	Training Execution and Evaluation Report	Within 1 month after training.	10
Environment and Social Safeguard			
22	Environmental Monitoring Report	To be submitted at every three (3) months after the commencement of the services, presenting the environmental impacts and implementation of environmental mitigation measures during and after the construction stage.	10
23	Environmental and Social Safeguard Evaluation Report	To be submitted by the end of construction, presenting the EMP, EMoP and RAP prepared.	20
Other Report			
24	Technical Report	As required or upon request.	As required

Chapter 8. Obligations of the Executing Agency

A certain range of arrangements and services will be provided by the Executing Agency to the Consultant for smooth implementation of the Consulting Services. In this context, the Executing Agency will:

1. Report and Data

Make available to the Consultant existing reports and data related to the Project;

2. Office Space

Provide an office space in the Headquarters of the Executing Agency with necessary equipment, furniture and utility. However, the Consultant's requirement for office space, including necessary equipment, furniture and utilities, should be clearly stated in the proposal with its rental cost for the case where PMUDC would be unable to provide such facilities;

3. Cooperation and Counterpart Staff

Appoint counterpart officials, agent and representative as may be necessary for effective implementation of the Consulting Services;

4. Assistance and Exemption

Use its best efforts to ensure that the assistance and exemption, as described in the Standard Request for Proposal issued by JICA, will be provided to the Consultant, in relation to

- work permit and such other documents;
- entry and exit visas, residence permits, exchange permits and such other documents
- clearance through customs;
- instructions and information to officials, agent and representatives of the Borrower's Government;
- exemption from any requirement for registration to practice their profession;
- privilege pursuant to the applicable law in the Borrower's Country.